GE Healthcare

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|---|---|---|
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| Octobre 2022 | | |

# DICOM Conformance Statement

# for Discovery RF180 system

# 1 CONFORMANCE STATEMENT OVERVIEW

This document describes the conformance of Digitec INSIDE_SW application to DICOM standard as regarding DICOM communication to save acquired images and associated Dose SR to a network storage device or CD-R, print to a networked hardcopy device and inform the information system about the work actually done

Table 1-1 shows network related services:

**Table 1-1**
**Network Services**

| SOP Classes | User of Service (SCU) | Provider of Service (SCP) |
|---|---|---|
| **Transfer** | | |
| Computed Radiology Image Storage | Yes | No |
| Digital X-Ray Image Storage for Presentation | Yes | No |
| X-Ray Angiographic Image Storage | Yes | No |
| X-Ray Radiofluoroscopic Image Storage | Yes | No |
| **Workflow Management** | | |
| Modality Worklist | Option | No |
| Storage Commitment Push Model | Option | No |
| Modality Performed Procedure Step | Option | No |
| **Query/Retrieve** | | |
| Patient Root Q/R - FIND | Option | No |
| Patient Root Q/R – MOVE | Option | No |
| Study Root Q/R - FIND | Option | No |
| Study Root Q/R - MOVE | Option | No |
| **Print Management** | | |
| Basic Grayscale Print Management | Option | No |
| **Notes, Reports, Measurements Transfer** | | |
| X-Ray Radiation Dose SR | Option | No |

The SOP Classes are categorized as follows:

**Table 1-2**
**UID VALUES**

| UID Value | UID NAME | Category |
|---|---|---|
| 1.2.840.10008.5.1.4.1.1.1 | Computed Radiology Image Storage | Transfer |
| 1.2.840.10008.5.1.4.1.1.1.1 | Digital X-Ray Image Storage for Presentation | Transfer |
| 1.2.840.10008.5.1.4.1.1.12.1 | X-Ray Angiographic Image Storage | Transfer |
| 1.2.840.10008.5.1.4.1.1.12.2 | X-Ray Radiofluoroscopic Image Storage | Transfer |
| 1.2.840.10008.5.1.4.31 | Modality Worklist | Workflow Management |
| 1.2.840.10008.1.20.1 | Storage Commitment Push Model | Workflow Management |
| 1.2.840.10008.3.1.2.3.3 | Modality Performed Procedure Step | Workflow Management |
| 1.2.840.10008.5.1.4.1.2.1.1 | Patient Root Q/R - FIND | Query/Retrieve |
| 1.2.840.10008.5.1.4.1.2.1.2 | Patient Root Q/R – MOVE | Query/Retrieve |
| 1.2.840.10008.5.1.4.1.2.2.1 | Study Root Q/R - FIND | Query/Retrieve |
| 1.2.840.10008.5.1.4.1.2.2.2 | Study Root Q/R - MOVE | Query/Retrieve |
| 1.2.840.10008.5.1.1.9 | Basic Grayscale Print Management | Print Management |
| 1.2.840.10008.5.1.4.1.1.88.67 | X-Ray Radiation Dose SR | Report Transfer |

Table 1-3 shows Supported Media Storage Application Profiles (with roles):

**Table 1-3**
**Media Services**

| Media Storage Application Profile | Write Files (FSC or FSU) | Read Files (FSR) |
|---|---|---|
| **Compact Disk - Recordable** | | |
| Augmented General Purpose CD-R | FSC: Option FSU: No | No |
| **DVD** | | |
| General Purpose DVD-RAM | FSC: Option FSU: No | No |

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# 3 INTRODUCTION

## 3.1 Revision History

| | |
|---|---|
| **V1.0.0** | First release of this document. It claims conformace to *Verification SCP/SCU, Storage CR/DX/XA/RF SCU, Storage Commitment SCU, Basic Grayscale Print SCU, Modality Worklist SCU, MPPS SCU, Query/Retrieve SCU, Dicom Media FSC* services, *X-Ray Radiation Dose Structured Report (Storage and Dicom Media)*. |
| **V1.0.1** | Added presence of module "Patient Study" in "X-Ray Radiation Dose SR" IOD. |
| **V1.0.2** | Modified Source Field of 0008,1010 "Station Name" in "General Equipment Module"; field value changed from "CONFIG" to "FIX". |
| **V1.0.3** | Added note to table 4.2-16.. |

## 3.2 Audience

This document is written for the people that need to understand how INSIDE_SW will integrate into their healthcare facility. This includes both those responsible for overall imaging network policy and architecture, as well as integrators who need to have a detailed understanding of the DICOM features of the product. This document contains some basic DICOM definitions so that any reader may understand how this product implements DICOM features. However, integrators are expected to fully understand all the DICOM terminology, how the tables in this document relate to the product's functionality, and how that functionality integrates with other devices that support compatible DICOM features.

## 3.3 Remarks

The scope of this DICOM Conformance Statement is to facilitate integration between INSIDE_SW and other DICOM products. The Conformance Statement should be read and understood in conjunction with the DICOM Standard. DICOM by itself does not guarantee interoperability. The Conformance Statement does, however, facilitate a first-level comparison for interoperability between different applications supporting compatible DICOM functionality.

This Conformance Statement is not supposed to replace validation with other DICOM equipment to ensure proper exchange of intended information. In fact, the user should be aware of the following important issues:

— The comparison of different Conformance Statements is just the first step towards assessing interconnectivity and interoperability between the product and other DICOM conformant equipment.

— Test procedures should be defined and executed to validate the required level of interoperability with specific compatible DICOM equipment, as established by the healthcare facility.

INSIDE_SW conforms to the standards defined by Integrating the Healthcare Enterprise (IHE). The IHE Integration Statement for INSIDE_SW, together with the IHE Technical Framework, may facilitate the process of validation testing.

## 3.4 Terms and Definitions

Informal definitions are provided for the following terms used in this Conformance Statement. The DICOM Standard is the authoritative source for formal definitions of these terms.

**Abstract Syntax** – the information agreed to be exchanged between applications, generally equivalent to a Service/Object Pair (SOP) Class. Examples : Verification SOP Class, Modality Worklist Information Model Find SOP Class, Computed Radiography Image Storage SOP Class.

**Application Entity (AE)** – an end point of a DICOM information exchange, including the DICOM network or media interface software; i.e., the software that sends or receives DICOM information objects or messages. A single device may have multiple Application Entities.

**Application Entity Title** – the externally known name of an *Application Entity*, used to identify a DICOM application to other DICOM applications on the network.

**Application Context** – the specification of the type of communication used between *Application Entities*. Example: DICOM network protocol.

**Association** – a network communication channel set up between *Application Entities*.

**Attribute** – a unit of information in an object definition; a data element identified by a *tag*. The information may be a complex data structure (Sequence), itself composed of lower level data elements. Examples: Patient ID (0010,0020), Accession Number (0008,0050), Photometric Interpretation (0028,0004), Procedure Code Sequence (0008,1032).

**Information Object Definition (IOD)** – the specified set of *Attributes* that comprise a type of data object; does not represent a specific instance of the data object, but rather a class of similar data objects that have the same properties. The *Attributes* may be specified as Mandatory (Type 1), Required but possibly unknown (Type 2), or Optional (Type 3), and there may be conditions associated with the use of an Attribute (Types 1C and 2C). Examples: MR Image IOD, CT Image IOD, Print Job IOD.

**Media Application Profile** – the specification of DICOM information objects and encoding exchanged on removable media (e.g., CDs)

**Module** – a set of *Attributes* within an *Information Object Definition* that are logically related to each other. Example: Patient Module includes Patient Name, Patient ID, Patient Birth Date, and Patient Sex.

**Negotiation** – first phase of *Association* establishment that allows *Application Entities* to agree on the types of data to be exchanged and how that data will be encoded.

**Presentation Context** – the set of DICOM network services used over an *Association*, as negotiated between *Application Entities*; includes *Abstract Syntaxes* and *Transfer Syntaxes*.

**Protocol Data Unit (PDU)** – a packet (piece) of a DICOM message sent across the network. Devices must specify the maximum size packet they can receive for DICOM messages.

**Security Profile** – a set of mechanisms, such as encryption, user authentication, or digital signatures, used by an *Application Entity* to ensure confidentiality, integrity, and/or availability of exchanged DICOM data

**Service Class Provider (SCP)** – role of an *Application Entity* that provides a DICOM network service; typically, a server that performs operations requested by another *Application Entity* (*Service Class User*). Examples: Picture Archiving and Communication System (image storage SCP, and image query/retrieve SCP), Radiology Information System (modality worklist SCP).

**Service Class User (SCU)** – role of an *Application Entity* that uses a DICOM network service; typically, a client. Examples: imaging modality (image storage SCU, and modality worklist SCU), imaging workstation (image query/retrieve SCU)

**Service/Object Pair (SOP) Class** – the specification of the network or media transfer (service) of a particular type of data (object); the fundamental unit of DICOM interoperability specification. Examples: Ultrasound Image Storage Service, Basic Grayscale Print Management.

**Service/Object Pair (SOP) Instance** – an information object; a specific occurrence of information exchanged in a *SOP Class*. Examples: a specific x-ray image.

**Tag** – a 32-bit identifier for a data element, represented as a pair of four digit hexadecimal numbers, the “group” and the “element”. If the “group” number is odd, the tag is for a private (manufacturer-specific) data element. Examples: (0010,0020) [Patient ID], (07FE,0010) [Pixel Data], (0019,0210) [private data element]

**Transfer Syntax** – the encoding used for exchange of DICOM information objects and messages. Examples: *JPEG* compressed (images), little endian explicit value representation.

**Unique Identifier (UID)** – a globally unique "dotted decimal" string that identifies a specific object or a class of objects; an ISO-8824 Object Identifier. Examples: Study Instance UID, SOP Class UID, SOP Instance UID.

**Value Representation (VR)** – the format type of an individual DICOM data element, such as text, an integer, a person's name, or a code. DICOM information objects can be transmitted with either explicit identification of the type of each data element (Explicit VR), or without explicit identification (Implicit VR); with Implicit VR, the receiving application must use a DICOM data dictionary to look up the format of each data element.

## 3.5 Basics of DICOM Communication

This section describes terminology used in this Conformance Statement for the non-specialist. The key terms used in the Conformance Statement are highlighted in *italics* below. This section is not a substitute for training about DICOM, and it makes many simplifications about the meanings of DICOM terms.

Two *Application Entities* (devices) that want to communicate with each other over a network using DICOM protocol must first agree on several things during an initial network "handshake". One of the two devices must initiate an *Association* (a connection to the other device), and ask if specific services, information, and encoding can be supported by the other device (*Negotiation*).

DICOM specifies a number of network services and types of information objects, each of which is called an *Abstract Syntax* for the Negotiation. DICOM also specifies a variety of methods for encoding data, denoted *Transfer Syntaxes*. The Negotiation allows the initiating Application Entity to propose combinations of Abstract Syntax and Transfer Syntax to be used on the Association; these combinations are called *Presentation Contexts.* The receiving Application Entity accepts the Presentation Contexts it supports.

For each Presentation Context, the Association Negotiation also allows the devices to agree on *Roles* – which one is the *Service Class User* (SCU - client) and which is the *Service Class Provider* (SCP - server). Normally the device initiating the connection is the SCU, i.e., the client system calls the server, but not always.

The Association Negotiation finally enables exchange of maximum network packet (*PDU*) size, security information, and network service options (called *Extended Negotiation* information).

The Application Entities, having negotiated the Association parameters, may now commence exchanging data. Common data exchanges include queries for worklists and lists of stored images, transfer of image objects and analyses (structured reports), and sending images to film printers. Each exchangeable unit of data is formatted by the sender in accordance with the appropriate *Information Object Definition*, and sent using the negotiated Transfer Syntax. There is a Default Transfer Syntax that all systems must accept, but it may not be the most efficient for some use cases. Each transfer is explicitly acknowledged by the receiver with a *Response Status* indicating success, failure, or that query or retrieve operations are still in process.

Two Application Entities may also communicate with each other by exchanging media (such as a CD-R). Since there is no Association Negotiation possible, they both use a *Media Application Profile* that specifies "pre-negotiated" exchange media format, Abstract Syntax, and Transfer Syntax.

## 3.6 Abbreviations

Abbreviations used in this conformance statement are listed below:

| | |
|---|---|
| AE | Application Entity |

| | |
|---|---|
| AET | Application Entity Title |
| CD-R | Compact Disk Recordable |
| DICOM | Digital Imaging and Communications in Medicine |
| FSC | File-Set Creator |
| FSU | File-Set Updater |
| FSR | File-Set Reader |
| IHE | Integrating the Healthcare Enterprise |
| IOD | Information Object Definition |
| IPv4 | Internet Protocol version 4 |
| IPv6 | Internet Protocol version 6 |
| ISO | International Organization for Standards |
| MPPS | Modality Performed Procedure Step |
| MSPS | Modality Scheduled Procedure Step |
| MWL | Modality Worklist |
| PDU | Protocol Data Unit |
| SCP | Service Class Provider |
| SCU | Service Class User |
| SOP | Service-Object Pair |
| SPS | Scheduled Procedure Step |
| SR | Structured Reporting |
| TCP/IP | Transmission Control Protocol/Internet Protocol |
| VR | Value Representation |

In the document tables a number of abbreviations are used in specific columns.

The abbreviations used in the “Presence of Module/Presence of Value/Presence of Item” column are:

- VNAP Value Not Always Present (sent without value field if no value is present)
- ANAP Attribute/Item Not Always Present
- MNAP Module Not Always Present
- ALWAYS Always Present with a valid value
- EMPTY Attribute is always present but without value field (empty)

The abbreviations used in the “Source” column are:

- MWL the attribute/item value source is Modality Worklist
- USER the attribute/item value source is from User input
- AUTO the attribute/item value is generated automatically
- MPPS the attribute/item value is the same as that used for MPPS
- CONFIG the attribute/item value source is a configurable parameter
- FIX the attribute/item value is fixed

## 3.7 References

NEMA free published DICOM Standard:

NEMA PS3 Digital Imaging and Communications in Medicine (DICOM) Standard, available free at http://medical.nema.org/

# 4 NETWORKING

## 4.1 Implementation Model

### 4.1.1 Application Data Flow

Figure 4.1-1 is the Data Flow Diagram representing all the Application Entities present in the implementation. The Diagram graphically depicts the relationship of the AE's use of DICOM to Real-World Activities as well as any applicable user interaction.

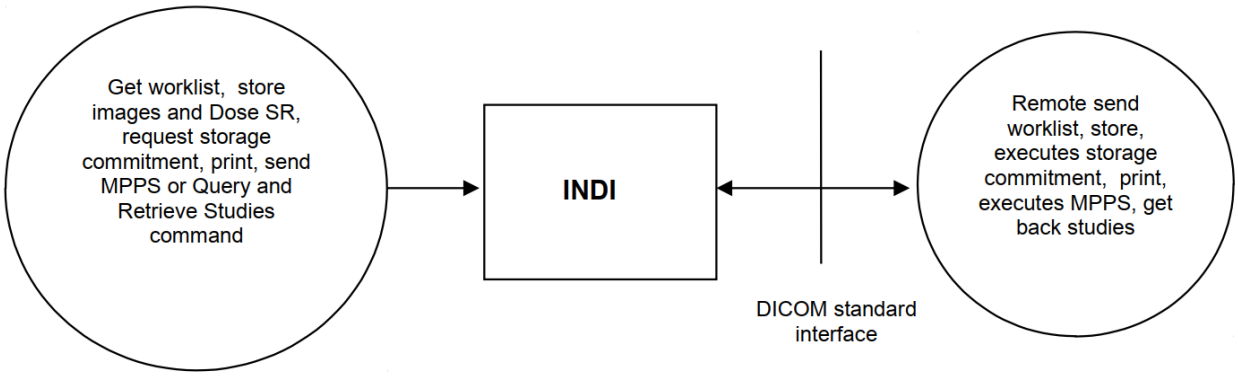

Get worklist, store images and Dose SR, request storage commitment, print, send MPPS or Query and Retrieve Studies command
INDI
DICOM standard interface
Remote send worklist, store, executes storage commitment, print, executes MPPS, get back studies

**Figure 4.1-1**
**APPLICATION DATA FLOW DIAGRAM**

### 4.1.2 Functional Definition of AE's

#### 4.1.2.1 Functional Definition of INDI AE

*INSIDE_SW Network Dicom Interface* (INDI) is activated in any step of the workflow of the modality. Operator starts daily activity by getting the worklist from HIS/RIS, admitting scheduled patient and acquiring requested X-Ray images.

During each phase of the activity, specific DICOM services are activated to communicate to DICOM peer servers as described in the following.

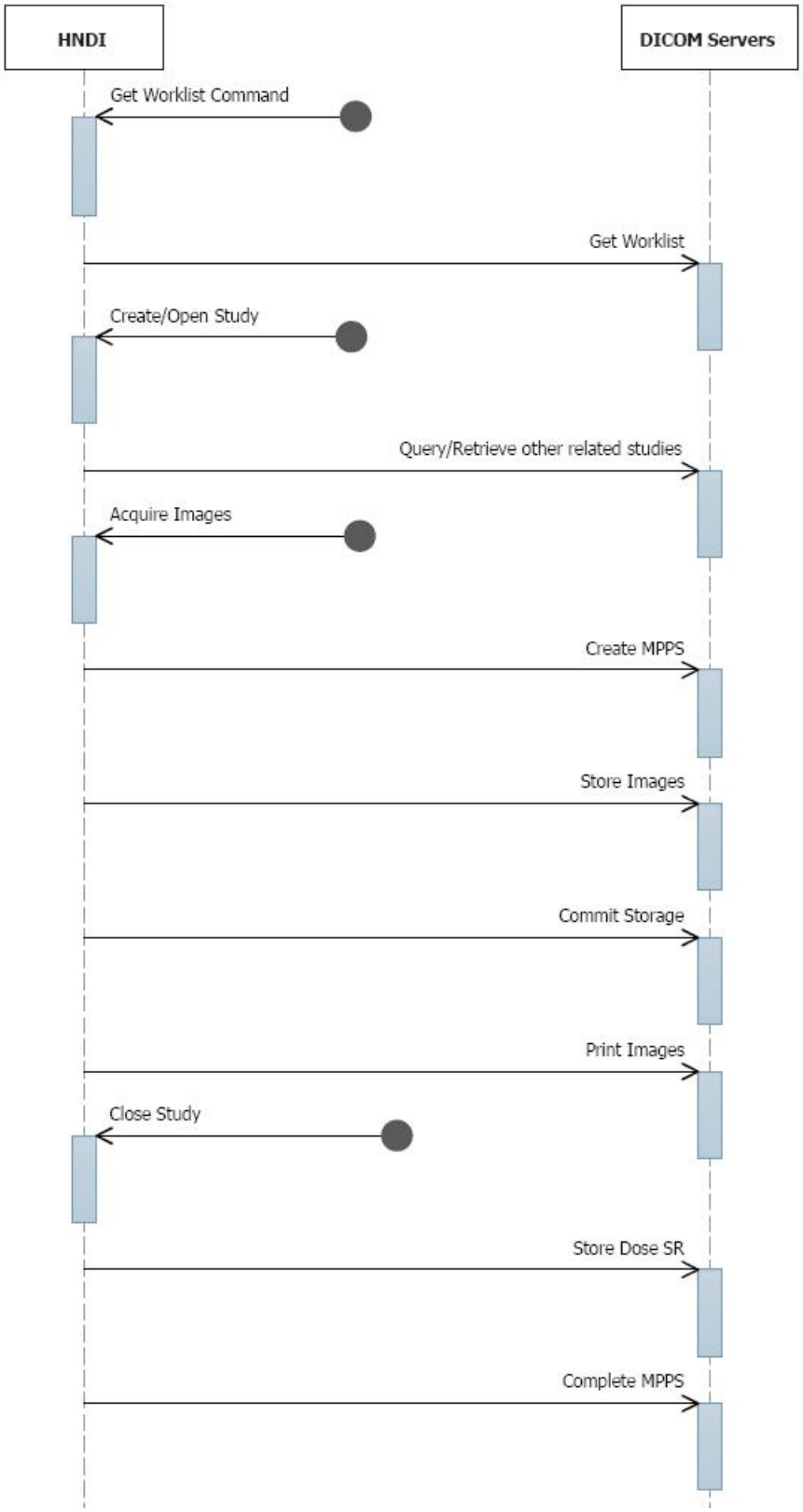
### 4.1.3 Sequencing of Real World Activities

The following picture shows the workflow at the modality and the sequencing of the activation of the DICOM services related to it.

The service execution sequence shown is merely representative of a typical case. In other real cases some of the services can be absent or can occur in a different time sequence, depending on supported optional services, on operator choice and modality settings.

In the following diagram all DICOM SCPs are grouped under the "DICOM Servers" label. In a real environment we can find a wide variety of grouping sets. All the services may be implemented in the same device/system or a single device can be dedicate to a restrict set of services.

The AET of the SCPs reflect the server-service layout. INDI can be programmed to use a dedicated AET for each service SCP.


HNDI
DICOM Servers
Get Worklist Command
Get Worklist
Create/Open Study
Query/Retrieve other related studies
Acquire Images
Create MPPS
Store Images
Commit Storage
Print Images
Close Study
Store Dose SR
Complete MPPS

## 4.2 AE Specifications

### 4.2.1 INDI AE Specification

#### 4.2.1.1 SOP Classes

INDI AE provides Standard Conformance to the following SOP Classes:

**Table 4.2-1**
**SOP Classes for INDI**

| SOP Class Name | SOP Class UID | SCU | SCP |
|---|---|---|---|
| Computed Radiology Image Storage | 1.2.840.10008.5.1.4.1.1.1 | Yes | Yes (1) |
| Digital X-Ray Image Storage for Presentation | 1.2.840.10008.5.1.4.1.1.1.1 | Yes | Yes (1) |
| X-Ray Angiographic Image Storage | 1.2.840.10008.5.1.4.1.1.12.1 | Yes | Yes (1) |
| X-Ray Radiofluoroscopic Image Storage | 1.2.840.10008.5.1.4.1.1.12.2 | Yes | Yes (1) |
| Modality Worklist | 1.2.840.10008.5.1.4.31 | Yes | No |
| Storage Commitment Push Model | 1.2.840.10008.1.20.1 | Yes | No |
| Modality Performed Procedure Step | 1.2.840.10008.3.1.2.3.3 | Yes | No |
| Patient Root Q/R - FIND | 1.2.840.10008.5.1.4.1.2.1.1 | Yes | No |
| Patient Root Q/R – MOVE | 1.2.840.10008.5.1.4.1.2.1.2 | Yes | No |
| Study Root Q/R - FIND | 1.2.840.10008.5.1.4.1.2.2.1 | Yes | No |
| Study Root Q/R - MOVE | 1.2.840.10008.5.1.4.1.2.2.2 | Yes | No |
| Basic Grayscale Print Management | 1.2.840.10008.5.1.1.9 | Yes | No |
| X-Ray Radiation Dose SR Storage | 1.2.840.10008.5.1.4.1.1.88.67 | Yes | No |

(1) The SCP role is assumed only during execution of Query/Retrieve service accepting C-STORE command following a C-MOVE.

#### 4.2.1.2 Association Policies

##### 4.2.1.2.1 General

The DICOM standard application context name for DICOM 3.0 is always proposed:

**Table 4.2-2**
**DICOM Application Context**

| | |
|---|---|
| Application Context Name | 1.2.840.10008.3.1.1.1 |

##### 4.2.1.2.2 Number of Associations.

INDI initiates one Association at a time for storage and print service processing transfer request in the active job queue list. Only one job will be active at a time, the others remain pending until the active job is completed or failed. At the same time INDI can start an association for worklist, MPPS, storage commitment, verify, query/retrieve service.

**Table 4.2-3**
**Number of Associations as an Association Initiator for INDI**

| | |
|---|---|
| Maximum number of simultaneous associations | 2 |

**Table 4.2-4**
**Number of Associations as an Association Acceptor for INDI**

| | |
|---|---|
| Maximum number of simultaneous associations | 0 |

#### 4.2.1.2.3 Asynchronous Nature

INDI does not support asynchronous communication.

#### 4.2.1.2.4 Implementation Identifying Information

The implementation information for this Application Entity is:

**Table 4.2-5**
**DICOM Implementation Class and Version for INDI**

| | |
|---|---|
| Implementation Class UID | 1.3.76.6.1.1.5.1.1 |
| Implementation Version Name | DIGITEC V5.1 |

### 4.2.1.3 Association Initiation Policy

#### 4.2.1.3.1 Activity – Send Images or X-Ray Dose SR to a remote server

##### 4.2.1.3.1.1 Description and Sequencing of Activities

INDI initiates an association to transfer images or X-Ray Dose Report using C-STORE DICOM service. Only one image or X-Ray Dose SR will be transferred on a single association. C-STORE return status is waited and job status is modified according to it. The following picture details the message flow and sequencing.

#### 4.2.1.3.1.2 Proposed Presentation Contexts

INDI is capable of proposing the Presentation Contexts shown in the following table:

**Table 4.2-6**
**Proposed Presentation Contexts for INDI Storage**

| Presentation Context Table | | | | | |
|---|---|---|---|---|---|
| **Abstract Syntax** | | **Transfer Syntax** | | **Role** | **Extended Negotiation** |
| **Name** | **UID** | **Name List** | **UID List** | | |
| Computed Radiography Image Storage SOP Class | 1.2.840.10008.5.1.4.1.1.1 | DICOM Implicit VR Little Endian Transfer Syntax | 1.2.840.10008.1.2 | SCU | None |
| | | DICOM Explicit VR Little Endian Transfer Syntax | 1.2.840.10008.1.2.1 | | |
| Digital X-Ray Image Storage – For Presentation SOP Class | 1.2.840.10008.5.1.4.1.1.1.1 | DICOM Implicit VR Little Endian Transfer Syntax | 1.2.840.10008.1.2 | SCU | None |
| | | DICOM Explicit VR Little Endian Transfer Syntax | 1.2.840.10008.1.2.1 | | |
| X-Ray Angiographic Image Storage SOP Class | 1.2.840.10008.5.1.4.1.1.12.1 | DICOM Jpeg Lossless non-hirarchical,First-order Prediction P14 Transfer Syntax | 1.2.840.10008.1.2.4.70 | SCU | None |
| | | DICOM Implicit VR Little Endian Transfer Syntax | 1.2.840.10008.1.2 | | |
| | | DICOM Explicit VR Little Endian Transfer Syntax | 1.2.840.10008.1.2.1 | | |
| X-Ray Radiofluoroscopic Image Storage SOP Class | 1.2.840.10008.5.1.4.1.1.12.2 | DICOM Jpeg Lossless non-hirarchical,First-order Prediction P14 Transfer Syntax | 1.2.840.10008.1.2.4.70 | SCU | None |
| | | DICOM Implicit VR Little Endian Transfer Syntax | 1.2.840.10008.1.2 | | |
| | | DICOM Explicit VR Little Endian Transfer Syntax | 1.2.840.10008.1.2.1 | | |
| X-Ray Radiation Dose SR Storage | 1.2.840.10008.5.1.4.1.1.88.67 | DICOM Implicit VR Little Endian Transfer Syntax | 1.2.840.10008.1.2 | SCU | None |
| | | DICOM Explicit VR Little Endian Transfer Syntax | 1.2.840.10008.1.2.1 | | |

#### 4.2.1.3.1.3 SOP Specific Conformance for SOP Class(es)

All the DICOM transfer request and response are logged, together with tags and status details.
The behavior of INDI AE when encountering status codes in a C-STORE response is summarized in the Table below:

**Table 4.2-7**
**DICOM C-STORE Command Response Status Handling Behavior**

| Service Status | Further Meaning | Error Code | Behavior |
|---|---|---|---|
| Success | Success | 0000 | Job is marked as completed and removed from job queue |
| Any other error code | | | Association is released and job is marked as failed and a user warning is displayed |

The behavior of the AE during communication failure is summarized in a table as follows:

**Table 4.2-8**
**DICOM Command Communication Failure Behavior**

| Exception | Behavior |
|---|---|
| Association fail | Job is marked as failed and a user warning is displayed. |
| Timeout | The Association is aborted using A-ABORT and job is marked as failed. The reason is logged and reported to the user. |
| Association aborted | Job is marked as failed and a user warning is displayed. |

A failed send job can be restarted by user interaction. The system can be configured to automatically resend failed jobs. The delay between resending failed jobs and the number of retries is also configurable.

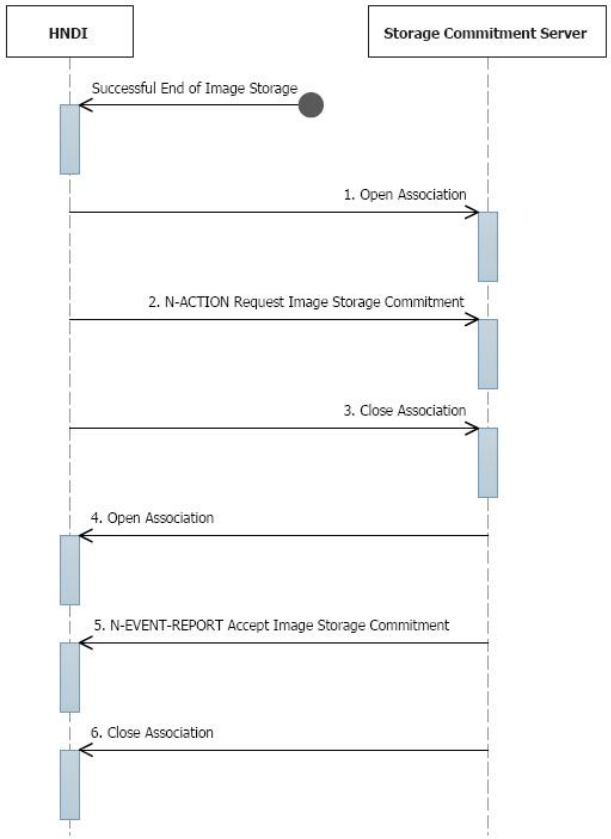
#### 4.2.1.3.2 Activity – Request Storage Commitment to a Remote Server

##### 4.2.1.3.2.1 Description and Sequencing of Activities

The system can be configured to request the storage commitment of each image transferred to a remote SCP with any of the above descripted storage services. This request starts an association negotiation for the *Storage Commitment Service.* The AET of the *Storage Commitment Service* SCP can be programmed; each programmed *Storage Service* SCP has an associated *Storage Commitment Service* SCP (storage commitment server on a modality base).

The acceptance of the commitment is expected to be transferred on a separate association started by the Storage Commitment Server AE.

The following picture details the message flow and sequencing.



#### 4.2.1.3.2.2 Proposed Presentation Contexts

INDI is capable of proposing the Presentation Contexts shown in the following table:

**Table 4.2-9**
**Proposed Presentation Contexts for INDI Storage Commitment**

| Presentation Context Table | | | | | |
|---|---|---|---|---|---|
| **Abstract Syntax** | | **Transfer Syntax** | | **Role** | **Extended** |
| **Name** | **UID** | **Name List** | **UID List** | | **Negotiation** |
| Storage Commitment SOP Class | 1.2.840.10008.2.20 .1 | DICOM Implicit VR Little Endian Transfer Syntax | 1.2.840.10008.1.2 | SCU | None |

#### 4.2.1.3.2.3 SOP Specific Conformance of Storage Commitment SOP Class

All the DICOM transfer request and response are logged, together with tags and status details.

- **N-ACTION** command

The behavior of INDI AE when encountering status codes in a N-ACTION response is summarized in the table below:

**Table 4.2-10**
**DICOM Storage Commitment N-ACTION**
**Command Response Status Handling Behavior**

| Service Status | Further Meaning | Error Code | Behavior |
|---|---|---|---|
| Success | Success | 0000 | The system close association and wait for N-EVENT-REPORT message on a separate association.. |
| Any other error code | | | Transaction is marked as failed. Any transaction will be retried after a programmable delay and for a programmable number of times. |

The behavior of the AE during communication failure is summarized in a table as follows:

**Table 4.2-11**
**DICOM Command Communication Failure Behavior**

| Exception | Behavior |
|---|---|
| Association fail | Transaction is marked as failed. Any transaction will be retried after a programmable delay and for a programmable number of times. |
| Timeout | |
| Association aborted | |

The following table shows specific attributes used in N-ACTION command:

**Table 4.2-12**
**Storage Commitment N-ACTION attributes**

| Attribute Name | Tag | VR | Value | Presence of Value | Source |
|---|---|---|---|---|---|
| Specific character set | (0008,0005) | CS | | ANAP | CONFIG |
| Transaction UID | (0008,1195) | UI | | ALWAYS | AUTO |
| Referenced SOP Sequence | (0008,1199) | SQ | | ALWAYS | |

| | | | | | |
|---|---|---|---|---|---|
| > Referenced SOP Class UID | (0008,1150) | UI | | ALWAYS | AUTO |
| > Reference SOP Instance UID | (0008,1155) | UI | | ALWAYS | AUTO |

- **N-EVENT-REPORT** command

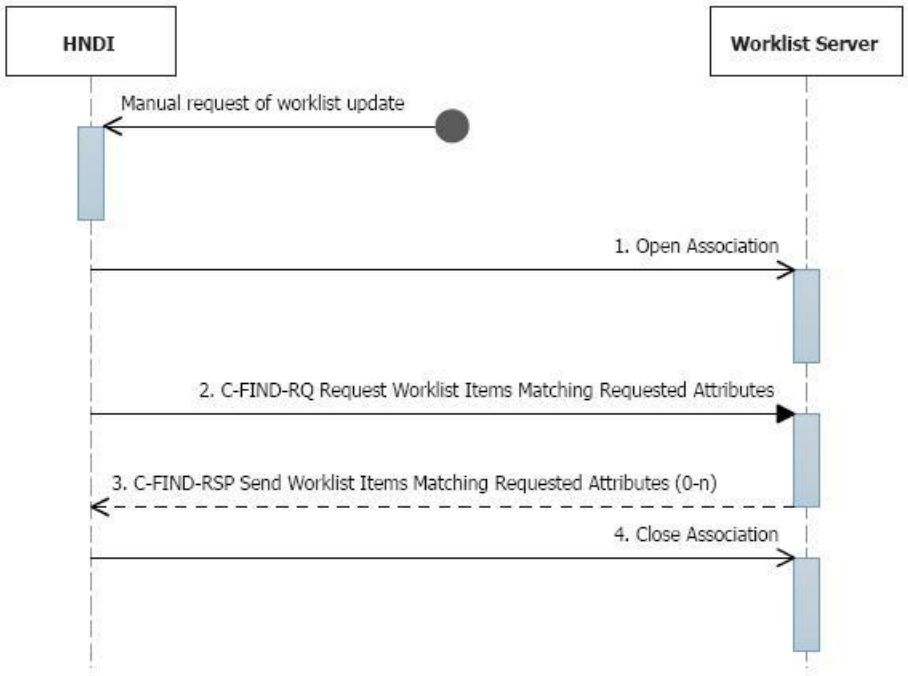
INDI accepts N-EVENT-REPORT only on an association separated from the N-ACTION one.

#### 4.2.1.3.3 Activity – Request Modality Worklist to a Remote Server

##### 4.2.1.3.3.1 Description and Sequencing of Activities

The request to get the worklist starts an association negotiation for the *Basic Worklist Management Service.* INDI requests a list of work studies to be executed at the current modality. The operator can filter the request by patient name (with wildcards), patient ID, date/time, accession number.

The following pictures shows the message flow and sequencing.


HNDI
Worklist Server
Manual request of worklist update
1. Open Association
2. C-FIND-RQ Request Worklist Items Matching Requested Attributes
3. C-FIND-RSP Send Worklist Items Matching Requested Attributes (0-n)
4. Close Association

##### 4.2.1.3.3.2 Proposed Presentation Contexts

INDI is capable of proposing the Presentation Contexts shown in the following table:

**Table 4.2-13**
**Proposed Presentation Contexts for INDI Modality Worklist**

| Presentation Context Table | | | | | |
|---|---|---|---|---|---|
| **Abstract Syntax** | | **Transfer Syntax** | | **Role** | **Extended** |
| **Name** | **UID** | **Name List** | **UID List** | | **Negotiation** |
| Modality Worklist Information Model -FIND SOP Class | 1.2.840.10008.5.1.4.31 | DICOM Implicit VR Little Endian Transfer Syntax | 1.2.840.10008.1.2 | SCU | None |

#### 4.2.1.3.3.3 SOP Specific Conformance of Modality Worklist SOP Class

All the DICOM transfer request and response are logged, together with tags and status details.
The behavior of INDI AE when encountering status codes in a N-ACTION response is summarized in the table below:

**Table 4.2-14**
**DICOM Modality Worklist C-FIND**
**Command Response Status Handling Behavior**

| Service Status | Further Meaning | Error Code | Behavior |
|---|---|---|---|
| Success | Success | 0000 | The working list is displayed in a dedicated dialog form. |
| Any other error code | | | The association is closed and an explicative error writing is displayed. |

The behavior of the AE during communication failure is summarized in a table as follows:

**Table 4.2-15**
**DICOM Command Communication Failure Behavior**

| Exception | Behavior |
|---|---|
| Association fail | An explicative error writing is displayed. |
| Timeout | |
| Association aborted | |

The following table shows specific attributes used in C-FIND-REQ command:

**Table 4.2-16**
**Modality Worklist C-FIND-REQ attributes**

| Attribute Name | Tag | VR | Matching Type | Presence of Value | Source |
|---|---|---|---|---|---|
| Specific character set | (0008,0005) | CS | | ANAP | CONFIG |
| Accession Number | (0008,0050) | SH | Single value | VNAP | USER |
| Referring Physician's Name | (0008,0090) | PN | | EMPTY | |
| Referenced Study Sequence | (0008,1110) | SQ | | ANAP | |
| Patient Name | (0010,0010) | PN | Single value / Wildcard | VNAP | USER |
| Patient ID | (0010,0020) | LO | Single value | VNAP | USER |
| Patient Birth Date | (0010,0030) | DA | | EMPTY | |
| Patient Sex | (0010,0040) | CS | | EMPTY | |
| Patient's Size | (0010,1020) | DS | | ANAP | |
| Patient's Size Code Sequence | (0010,1021) | SQ | | ANAP | |
| Patient's Weight | (0010,1030) | DS | | ANAP | |
| Study Instance UID | (0020,000D) | UI | | EMPTY | |
| Study ID | (0020,0010) | SH | | EMPTY | |
| Requesting Physician | (0032,1032) | PN | | EMPTY | |
| Requesting Service | (0032,1033) | LO | | EMPTY | |
| Requested Procedure Description | (0032,1060) | LO | | EMPTY | |
| Requested Procedure Code Sequence | (0032,1064) | SQ | | EMPTY | |
| Scheduled Procedure Step Sequence | (0040,0100) | SQ | | ALWAYS | |

| | | | | | |
|---|---|---|---|---|---|
| > Modality | (0008,0060) | CS | Single value or return key | VNAP | CONFIG |
| > Scheduled Station AE title | (0040,0001) | AE | Single value | VNAP | CONFIG |
| > Scheduled Procedure Step Start Date | (0040,0002) | DA | Single value / Range matching | VNAP | USER |
| > Scheduled Procedure Step Start Time | (0040,0003) | TM | Single value / Range matching | VNAP | USER |
| > Scheduled Performing Physician Name | (0040,0006) | PN | | EMPTY | |
| > Scheduled Procedure Step Description | (0040,0007) | LO | | EMPTY | |
| > Scheduled Protocol Code Sequence | (0040,0008) | SQ | | EMPTY | |
| > Scheduled Procedure Step ID | (0040,0009) | SH | | EMPTY | |
| > Scheduled Station Name | (0040,0010) | SH | | EMPTY | |
| > Scheduled Procedure Step Location | (0040,0011) | SH | | EMPTY | |
| Requested Procedure ID | (0040,1001) | SH | Single value | VNAP | USER |

**Note:** Worklist SCP should not insert in command response any attribute not listed in table 4.2-16. SCU detecting of unrequested attribute in response may lead to C-FIND command failure.

#### 4.2.1.3.4 Activity – Creating and updating Modality Performed Procedure Step

##### 4.2.1.3.4.1 Description and Sequencing of Activities

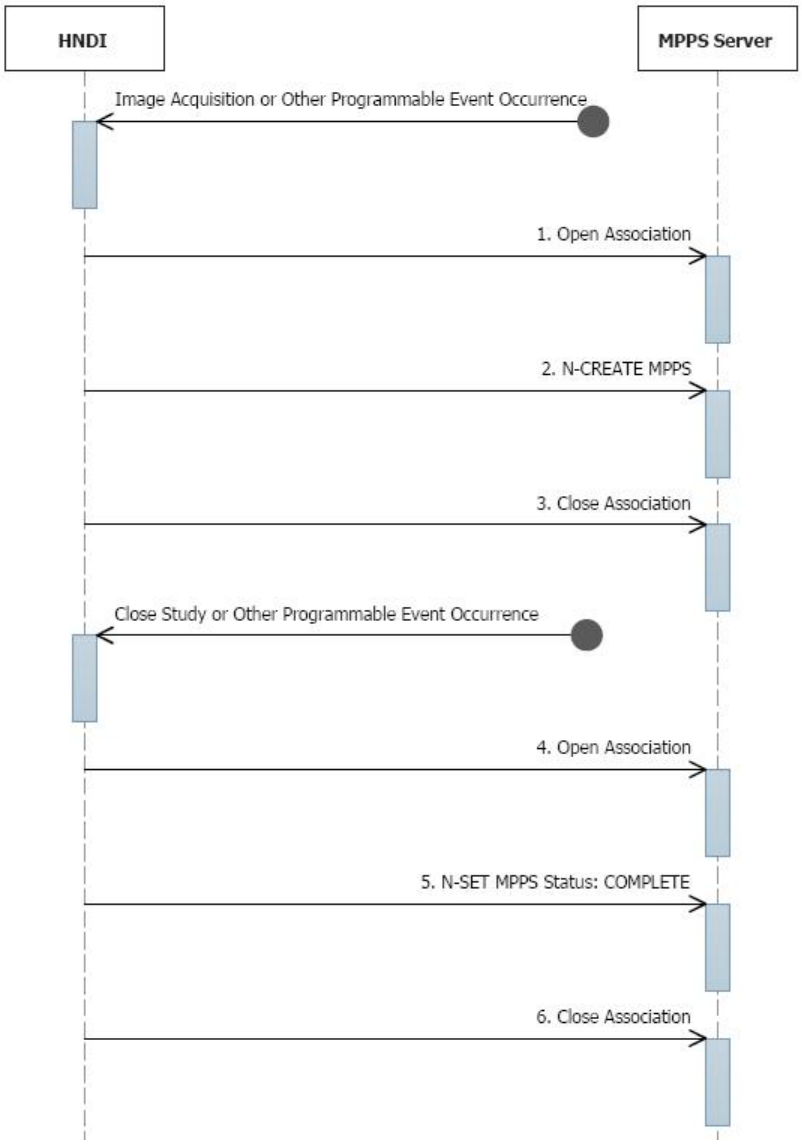
The system can be set to communicate to a remote server the acquisition of images related to the execution of a Scheduled Procedure Step. The acquired images IDs are inserted in a MPPS object to be sent remotely.

INDI starts an association of the *MPPS Service* to create and set an MPPS on the remote server.

The creation of an MPPS on the remote MPPS Server is started on the occurrence of specific events, such as *"End of Image Acquisition"* or *"Close Study".* The actual event starting MPPS service is programmable. The details of completion of the MPPS are programmable too.

If a MPPS related to the acquisition of images is in "in progress" status and new images are acquired with different "modality" attribute (i.e. CR/DX/XA/RF), the first MPPS is completed on the server and a new one is created for the new images.

The following pictures shows the message flow and sequencing for creation and set of MPPS on the server.




#### 4.2.1.3.4.2 Proposed Presentation Contexts

INDI is capable of proposing the Presentation Contexts shown in the following table:

**Table 4.2-17**
**Proposed Presentation Contexts for INDI MPPS**

| Presentation Context Table | | | | | |
|---|---|---|---|---|---|
| **Abstract Syntax** | | **Transfer Syntax** | | **Role** | **Extended** |
| **Name** | **UID** | **Name List** | **UID List** | | **Negotiation** |
| Modality Performed Procedure Step SOP Class | 1.2.840.10008.3.1.2.3.3 | DICOM Implicit VR Little Endian Transfer Syntax | 1.2.840.10008.1.2 | SCU | None |

#### 4.2.1.3.4.3 SOP Specific Conformance of Modality Performed Procedure Step Class

All the DICOM transfer request and response are logged, together with tags and status details.
The behavior of INDI AE when encountering status codes in a N-CREATE/N-SET response is summarized in the table below:

**Table 4.2-18**
**DICOM MPPS N-CREATE/N-SET**
**Command Response Status Handling Behavior**

| Service Status | Further Meaning | Error Code | Behavior |
|---|---|---|---|
| Success | Success | 0000 | The MPPS notification is internally marked as “successful”.. |
| Any other error code | | | The association is closed and an explicative error writing is displayed. |

The behavior of the AE during communication failure is summarized in a table as follows:

**Table 4.2-19**
**DICOM Command Communication Failure Behavior**

| Exception | Behavior |
|---|---|
| Association fail | An explicative error writing is displayed. |
| Timeout | |
| Association aborted | |

The following table shows specific attributes used in N-CREATE/N-SET commands:

**Table 4.2-20**
**MPPS N-CREATE/N-SET attributes**

| Attribute Name | Tag | VR | Value | Presence of Value N-CREATE | Presence of Value N-SET | Source |
|---|---|---|---|---|---|---|
| Specific character set | (0008,0005) | CS | | ANAP | ANAP | CONFIG |
| Modality | (0008,0060) | CS | | ALWAYS | | AUTO/MWL |
| Procedure Code Sequence | (0008,1032) | SQ | | VNAP | | MWL/USER |
| Referenced Study Sequence | (0008,1110) | SQ | | VNAP | | MWL |
| >Referenced SOP Class UID | (0008,1150) | UI | | ALWAYS | | MWL |
| >Referenced SOP Instance UID | (0008,1155) | UI | | ALWAYS | | MWL |
| Referenced Patient Sequence | (0008,1120) | SQ | | EMPTY | | |
| Patient Name | (0010,0010) | PN | | ALWAYS | | MWL/USER |
| Patient ID | (0010,0020) | LO | | VNAP | | MWL/USER |
| Patient Birth Date | (0010,0030) | DA | | VNAP | | MWL/USER |
| Patient Sex | (0010,0040) | CS | | VNAP | | MWL/USER |
| Image Area Dose Product | (0018,115E) | DS | | VNAP | VNAP | AUTO |
| Study ID | (0020,0010) | SH | | VNAP | | MWL/USER/ AUTO |
| Performed Station AE title | (0040,0241) | AE | | ALWAYS | | CONFIG |
| Performed Station Name | (0040,0242) | SH | | EMPTY | | |
| Performed Location | (0040,0243) | SH | | EMPTY | | |
| Performed Procedure Step Start Date | (0040,0244) | DA | | ALWAYS | | AUTO |

| | | | | | | |
|---|---|---|---|---|---|---|
| Performed Procedure Step Start Time | (0040,0245) | TM | | ALWAYS | | AUTO |
| Performed Procedure Step End Date | (0040,0250) | DA | | EMPTY | ALWAYS | AUTO |
| Performed Procedure Step End Time | (0040,0251) | TM | | EMPTY | ALWAYS | AUTO |
| Performed Procedure Step Status | (0040,0252) | CS | | ALWAYS | ALWAYS | AUTO |
| Performed Procedure Step ID | (0040,0253) | SH | | VNAP | | MWL/USER |
| Performed Procedure Step Description | (0040,0254) | LO | | VNAP | VNAP | MWL/USER |
| Performed Procedure Type Description | (0040,0255) | LO | | VNAP | VNAP | MWL/USER |
| Performed Protocol Code Sequence | (0040,0260) | SQ | | VNAP | | MWL/USER |
| > *Include "Code Sequence Macro"* | | | | | | |
| Scheduled Step Attribute Sequence | (0040,0270) | SQ | | ALWAYS | | |
| > Accession Number | (0008,0050) | SH | | VNAP | | MWL/USER |
| > Referenced Study Sequence | (0008,1110) | SQ | | EMPTY | | |
| > Study Instance UID | (0020,000D) | UI | | ALWAYS | | MWL/AUTO |
| > Requested Procedure Description | (0032,1060) | LO | | VNAP | | MWL/USER |
| > Scheduled Procedure Step Description | (0040,0007) | LO | | VNAP | | MWL/USER |
| > Scheduled Protocol Code Sequence | (0040,0008) | SQ | | VNAP | | MWL/USER |
| > *Include "Code Sequence Macro"* | | | | | | |
| > Scheduled Procedure Step ID | (0040,0009) | SH | | VNAP | | MWL/USER |
| > Requested Procedure ID | (0040,1001) | SH | | VNAP | | MWL/USER |
| Total Time of Fluoroscopy | (0040,0300) | US | | VNAP | VNAP | AUTO |
| Total Number of Exposures | (0040,0301) | US | | VNAP | VNAP | AUTO |
| Exposure Dose Sequence | (0040,030E) | SQ | | VNAP | VNAP | |
| > KVp | (0018,0060) | DS | | VNAP | VNAP | AUTO |
| > Exposure Time | (0018,1150) | IS | | VNAP | VNAP | AUTO |
| > Radiation Mode | (0018,115A) | CS | | VNAP | VNAP | AUTO |
| > X-ray Tube Current in uA | (0018,8151) | DS | | VNAP | VNAP | AUTO |
| Comments on Radiation Dose | (0040,0310) | ST | | EMPTY | EMPTY | |
| Performed Series Sequence | (0040,0340) | SQ | | VNAP | VNAP | |
| > Retrieve AE Title | (0008,0054) | AE | | EMPTY | EMPTY | |
| > Series Description | (0008,103E) | LO | | EMPTY | EMPTY | |
| > Performing Physician's Name | (0008,1050) | PN | | VNAP | VNAP | MWL/USER |
| > Operator's Name | (0008,1070) | PN | | EMPTY | EMPTY | |
| > Referenced Image Sequence | (0008,1140) | SQ | | ALWAYS | ALWAYS | |
| >> Referenced SOP Class UID | (0008,1150) | UI | | ALWAYS | ALWAYS | AUTO |
| >> Referenced SOP Instance UID | (0008,1155) | UI | | ALWAYS | ALWAYS | AUTO |
| > Protocol Name | (0018,1030) | LO | | VNAP | VNAP | CONFIG |
| > Series Instance UID | (0020,000E) | UI | | ALWAYS | ALWAYS | AUTO |
| > Referenced Non-Image Composite SOP Instance Sequence | (0040,0220) | SQ | | EMPTY | EMPTY | |

#### 4.2.1.3.5 Activity – Print Images using a Remote Hardcopy Printer

##### 4.2.1.3.5.1 Description and Sequencing of Activities

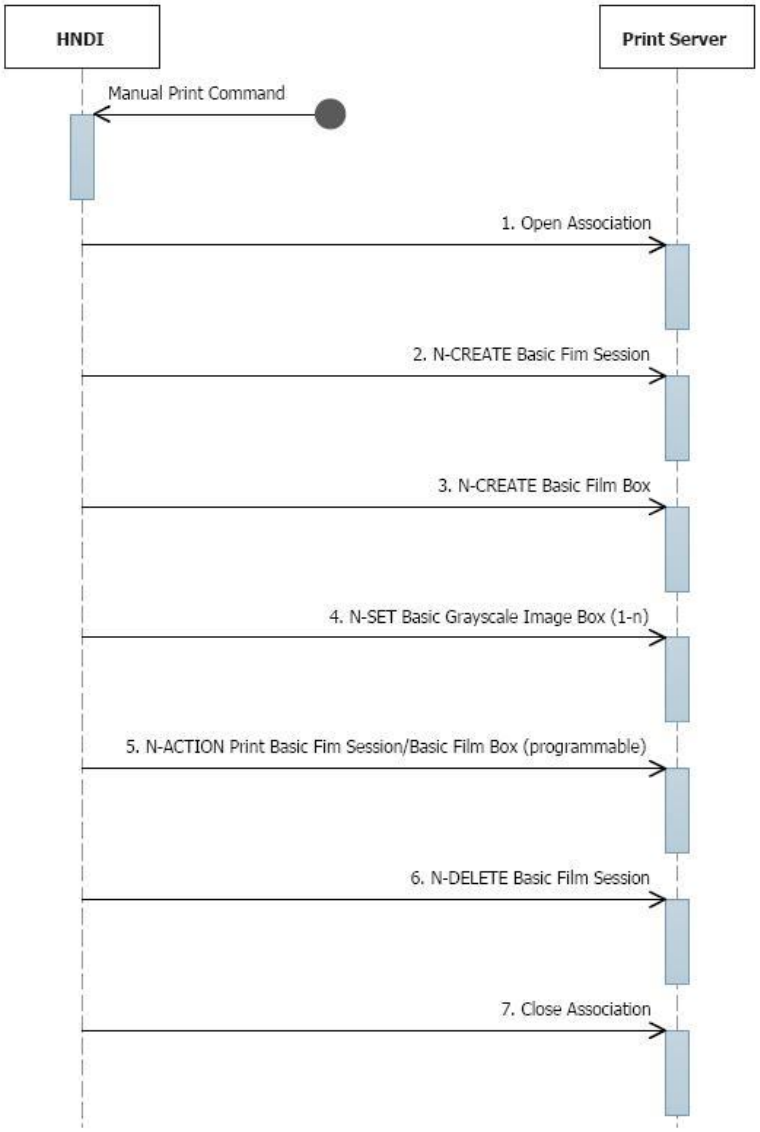
INDI can send images to a DICOM printer using the *Basic Grayscale Print Management Service.* On an operator request to print one or more film, INDI negotiates an association to it.

INDI open an association for each film to be printed.

The operator can activate a direct print of the frame currently displayed; a single frame print film (STANDARD 1\1 format) is requested to the Print Server.
Alternatively the modality has a film editor module giving the operator the possibility to select the film layout among those supported by the printer, to choose the frame to insert in any image box and to set other print parameters (film destination, print priority etc.).

The capabilities of each printer are loaded from a dedicated printer setup files. These files match the device features declared in the Printer DICOM Conformance Statement and in the Technical Manual.

The following pictures shows the message flow and sequencing.




#### 4.2.1.3.5.2 Proposed Presentation Contexts

INDI is capable of proposing the Presentation Contexts shown in the following table:

**Table 4.2-21**
**Proposed Presentation Contexts for INDI**

| Presentation Context Table | | | | | |
|---|---|---|---|---|---|
| **Abstract Syntax** | | **Transfer Syntax** | | **Role** | **Extended** |
| **Name** | **UID** | **Name List** | **UID List** | | **Negotiation** |
| Basic Grayscale Print Management Meta SOP Class | 1.2.840.10008.5.1.1.9 | DICOM Implicit VR Little Endian Transfer Syntax | 1.2.840.10008.1.2 | SCU | None |

#### 4.2.1.3.5.3 SOP Specific Conformance Common to all SOP Classes

All the DICOM transfer request and response are logged, together with tags and status details.
The behavior of the AE during communication failure is summarized in a table as follows:

**Table 4.2-22**
**DICOM Command Communication Failure Behavior**

| Exception | Behavior |
|---|---|
| Association fail | Job is marked as failed and a user warning is displayed. |
| Timeout | The Association is aborted using A-ABORT and job is marked as failed. The reason is logged and reported to the user. |
| Association aborted | Job is marked as failed and a user warning is displayed. |

A failed send job can be restarted by user interaction. The system can be configured to automatically resend failed jobs. The delay between resending failed jobs and the number of retries is also configurable.

#### 4.2.1.3.5.4 SOP Specific Conformance of Basic Film Session SOP Class

The following commands are used: N-CREATE, N-ACTION, N-DELETE.
The behavior of INDI AE when encountering status codes in a N-CREATE/N-ACTION/N-DELETE response is summarized in the Table below:

**Table 4.2-23**
**DICOM Basic Film Session N-CREATE/N-ACTION/N-DELETE**
**Command Response Status Handling Behavior**

| Service Status | Further Meaning | Error Code | Behavior |
|---|---|---|---|
| Success | Success | 0000 | N-CREATE/N-ACTION: the operations continue.<br>N-DELETE: the association is closed and the local copy of the session is destroyed. |
| Any other error code | | | The error code is associated to the local copy of the session job and the association is closed. |

**N-CREATE**. This command will be used to create a Film Session instance. The following table shows specific attributes.

**Table 4.2-24**
**Basic Film Session N-CREATE attributes**

| Attribute Name | Tag | VR | Value | Presence of Value | Source |
|---|---|---|---|---|---|
| Specific character set | (0008,0005) | CS | | ANAP | CONFIG |
| Number of Copies | (2000,0010) | IS | | ALWAYS | USER/CONFIG |
| Print Priority | (2000,0020) | CS | | VNAP | USER/CONFIG |
| Medium Type | (2000,0030) | CS | | VNAP | USER/CONFIG |
| Film Destination | (2000,0040) | CS | | VNAP | USER/CONFIG |
| Film Session Label | (2000,0050) | LO | | EMPTY | |

**N-ACTION**. This command will be used to create a Print Job Instance to print the whole printing session. No specific attribute will be included. Depending on SCP capabilities, SCU can be configured to print whole session in a single Print Job or to print each film by mean of separated N-ACTION Print Film Box services (see Basic Film Box SOP Class).

**N-DELETE**. This command will be used to delete the whole Print Session after the Print Job instance creation.

#### 4.2.1.3.5.5 SOP Specific Conformance of Basic Film Box SOP Class

The following commands are used: N-CREATE, N-ACTION.
The behavior of INDI AE when encountering status codes in a N-CREATE/N-ACTION response is summarized in the table below:

**Table 4.2-25**
**DICOM Basic Film Box N-CREATE/N-ACTION**
**Command Response Status Handling Behavior**

| Service Status | Further Meaning | Error Code | Behavior |
|---|---|---|---|
| Success | Success | 0000 | The operations continue. |
| Any other error code | | | The error code is associated to the local copy of the session job and the association is closed. |

**N-CREATE**. This command will be used to create a Film Box instance. The following table shows specific service attributes.

**Table 4.2-26**
**Basic Film Box N-CREATE attributes**

| Attribute Name | Tag | VR | Value | Presence of Value | Source |
|---|---|---|---|---|---|
| Specific character set | (0008,0005) | CS | | ANAP | CONFIG |
| Image Display Format | (2010,0010) | ST | | ALWAYS | USER/CONFIG |
| Annotation Display Format ID | (2010,0030) | CS | | EMPTY | |
| Film orientation | (2010,0040) | CS | | ALWAYS | USER/CONFIG |
| Film Size ID | (2010,0050) | CS | | ALWAYS | USER/CONFIG |
| Magnification Type | (2010,0060) | CS | | VNAP | USER/CONFIG |
| Smoothing Type | (2010,0080) | CS | | VNAP | USER/CONFIG |
| Border Density | (2010,0100) | CS | | VNAP | USER/CONFIG |
| Empty Image Density | (2010,0110) | CS | | VNAP | USER/CONFIG |
| Trim | (2010,0140) | CS | | VNAP | USER/CONFIG |
| Referenced Film Session Sequence | (2010,0500) | SQ | | ALWAYS | |
| >Referenced SOP Class UID | (0008,1150) | UI | | ALWAYS | AUTO |
| >Referenced SOP Instance UID | (0008,1155) | UI | | ALWAYS | AUTO |
| Requested Resolution ID | (2020,0050) | CS | | VNAP | USER/CONFIG |

**N-ACTION**. This command will be used to create a Print Job Instance to print a single Film Box. No specific attribute will be included. Depending on SCP capabilities, SCU can be configured to print each film box separately or to print the whole print session by mean of the N-ACTION Print Film Session service (see Basic Film Session SOP Class).

#### 4.2.1.3.5.6 SOP Specific Conformance of Basic Grayscale Image Box SOP Class

The following command a are used: N-SET.
The behavior of INDI AE when encountering status codes in a N-SET response is summarized in the table below:

**Table 4.2-27**
**DICOM Basic Grayscale Image Box N-SET**
**Command Response Status Handling Behavior**

| Service Status | Further Meaning | Error Code | Behavior |
|---|---|---|---|
| Success | Success | 0000 | The operations continue. |
| Any other error code | | | The error code is associated to the local copy of the session job and the association is closed. |

**N-SET**. This command will be used to update a Grayscale Image instance. The following table shows specific service attributes.

**Table 4.2-28**
**Basic Basic Grayscale Image Box N-SET attributes**

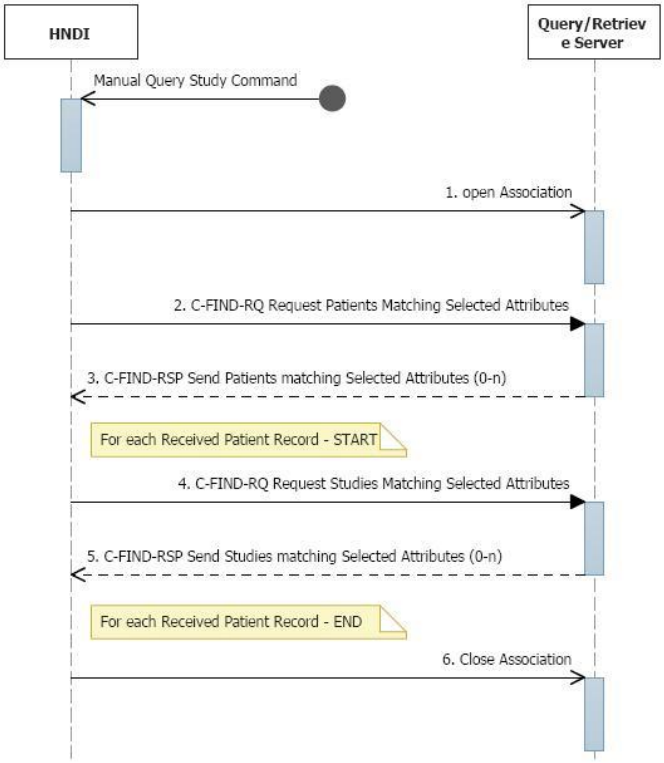
| Attribute Name | Tag | VR | Value | Presence of Value | Source |
|---|---|---|---|---|---|
| Specific character set | (0008,0005) | CS | | ANAP | CONFIG |
| Image Box Position | (2020,0010) | US | Fixed: 1 | ALWAYS | FIX |
| Basic Grayscale Image Sequence | (2020,0110) | SQ | | ALWAYS | |
| >Samples per Pixel | (0028,0002) | US | Fixed: 1 | ALWAYS | FIX |
| >Photometric Interpretation | (0028,0004) | CS | Fixed: MONOCHROME2 | ALWAYS | FIX |
| >Rows | (0028,0010) | US | | ALWAYS | AUTO |
| >Columns | (0028,0011) | US | | ALWAYS | AUTO |
| >Bits Allocated | (0028,0100) | US | 8,16 (Matches printer capabilities) | ALWAYS | AUTO/CONFIG |
| >Bits Stored | (0028,0101) | US | 8-16 (Matches printer capabilities) | ALWAYS | AUTO/CONFIG |
| >High Bit | (0028,0102) | US | (BitsStored-1)-(BitsAllocated-1) (Matches printer capabilities) | ALWAYS | AUTO/CONFIG |
| >Pixel Representation | (0028,0103) | US | Fixed: 0 | ALWAYS | FIX |
| >Pixel Data | (7FE0,0010) | OB/ OW | | ALWAYS | AUTO |

### 4.2.1.3.6 Activity – Querying and Retrieving Studies

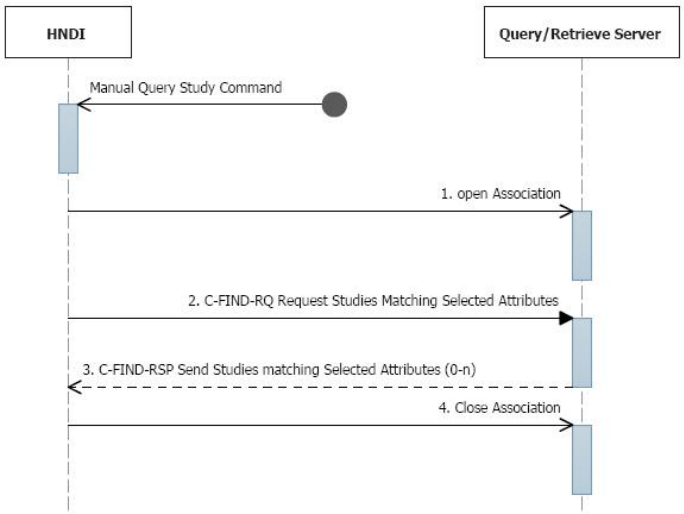
#### 4.2.1.3.6.1 Description and Sequencing of Activities

The operator can select a set of key used by INDI to find useful studies on a remote DICOM archive. The remote DICOM AE sends back a list of matching studies. According to DICOM Standard, INDI can query studies both in Patient Root Mode and Study Root Mode.

The following pictures shows the message flow and sequencing during a query of the study list in Patient Root Mode.

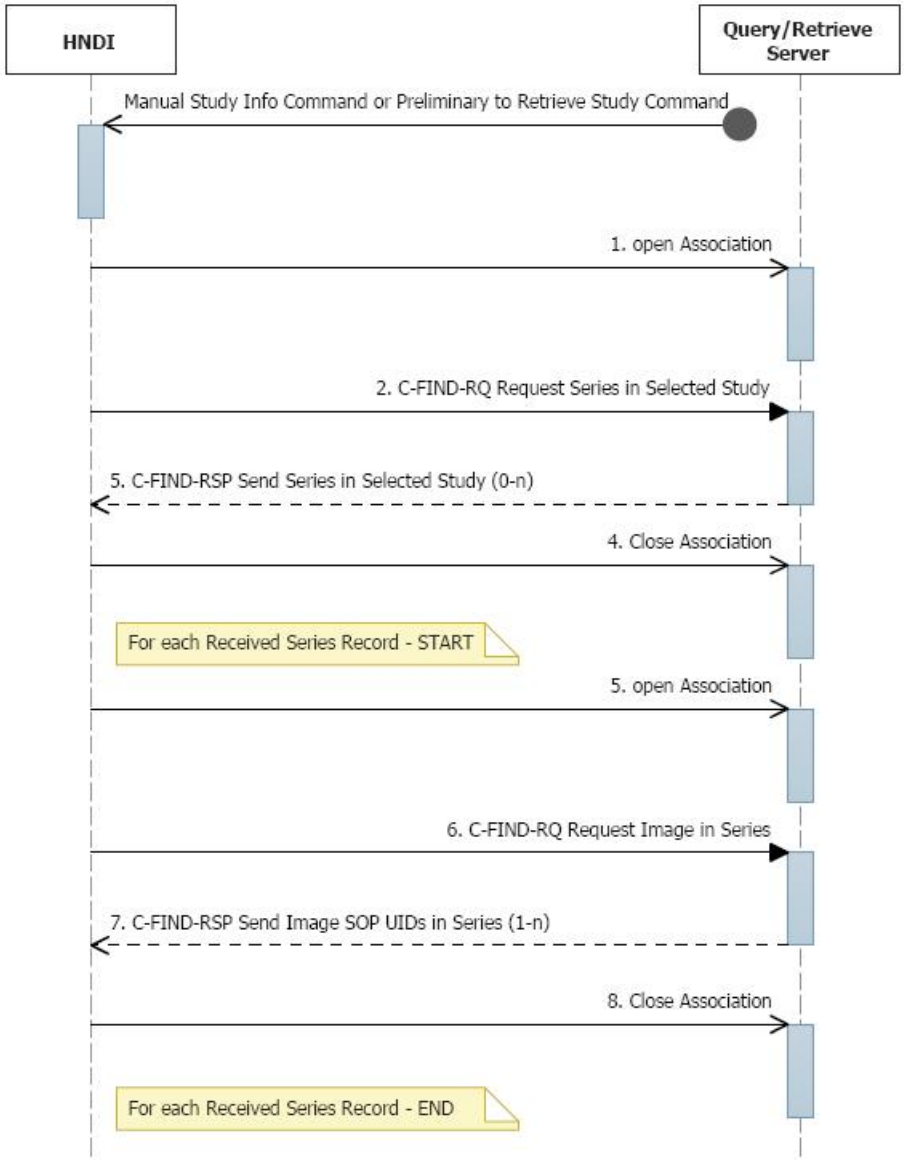

HNDI
Query/Retriev e Server
Manual Query Study Command
1. open Association
2. C-FIND-RQ Request Patients Matching Selected Attributes
3. C-FIND-RSP Send Patients matching Selected Attributes (0-n)
For each Received Patient Record - START
4. C-FIND-RQ Request Studies Matching Selected Attributes
5. C-FIND-RSP Send Studies matching Selected Attributes (0-n)
For each Received Patient Record - END
6. Close Association

The following pictures shows the message flow and sequencing during a query of the study list in Study Root Mode.

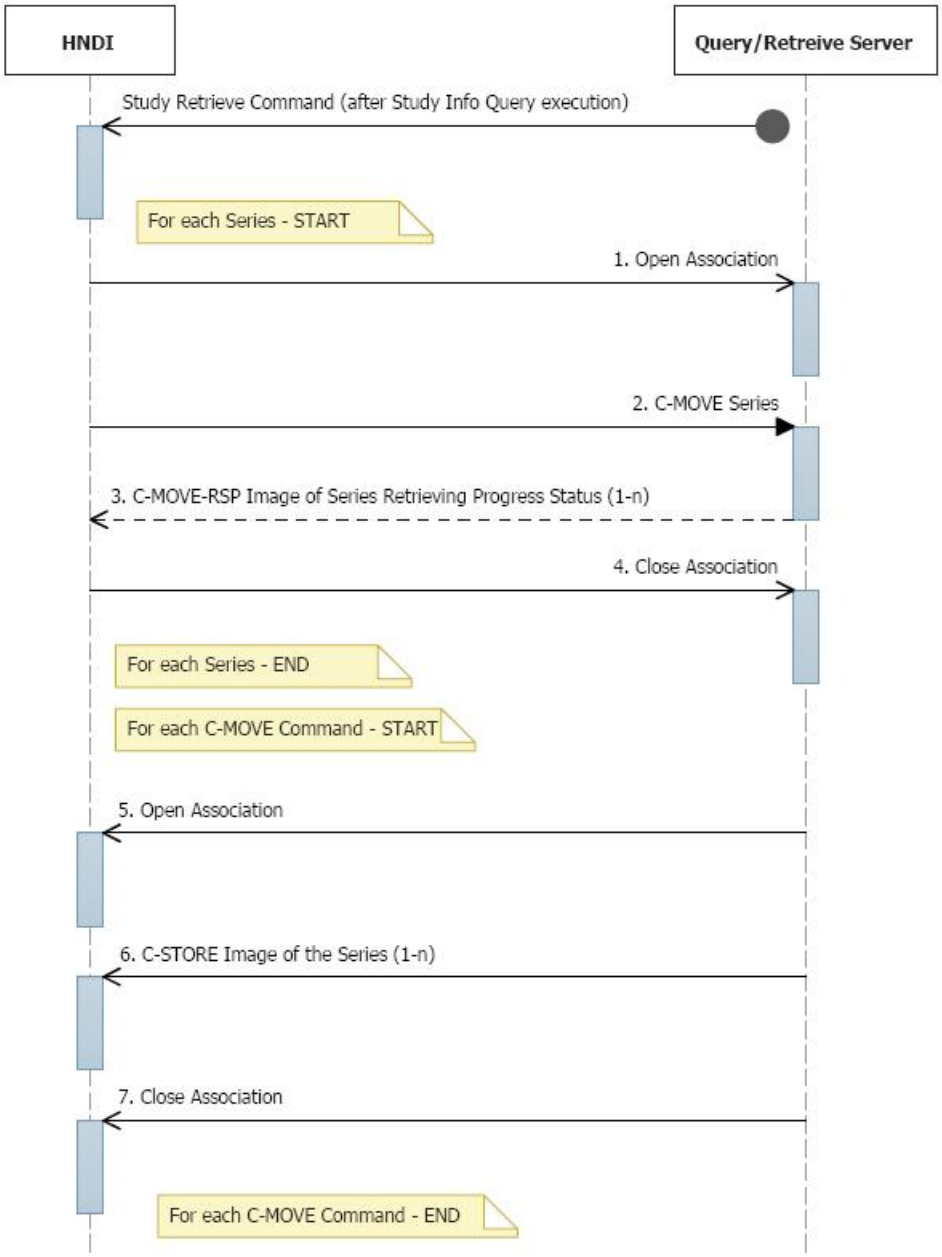

HNDI
Query/Retrieve Server
Manual Query Study Command
1. open Association
2. C-FIND-RQ Request Studies Matching Selected Attributes
3. C-FIND-RSP Send Studies matching Selected Attributes (0-n)
4. Close Association

The operator selects one or more studies to be retrieved by INDI interface. The retrieved studies, stored locally in DICOM 3.0 PS 10 (DICOMDIR file set) can be displayed but they cannot be modified. To delete the retrieved studies a dedicated command is provided.

The following pictures shows the message flow and sequencing during the query of the detailed descending tree (study – series – image) of a selected study.


HNDI
Query/Retrieve Server
Manual Study Info Command or Preliminary to Retrieve Study Command
1. open Association
2. C-FIND-RQ Request Series in Selected Study
5. C-FIND-RSP Send Series in Selected Study (0-n)
4. Close Association
For each Received Series Record - START
5. open Association
6. C-FIND-RQ Request Image in Series
7. C-FIND-RSP Send Image SOP UIDs in Series (1-n)
8. Close Association
For each Received Series Record - END

The following picture shows the message flow and sequencing during the retrieve of the images belonging to a selected study. Images are identified by means of the class and instance UIDs received during the execution of the query commands.


HNDI
Query/Retreive Server
Study Retrieve Command (after Study Info Query execution)
For each Series - START
1. Open Association
2. C-MOVE Series
3. C-MOVE-RSP Image of Series Retrieving Progress Status (1-n)
4. Close Association
For each Series - END
For each C-MOVE Command - START
5. Open Association
6. C-STORE Image of the Series (1-n)
7. Close Association
For each C-MOVE Command - END

#### 4.2.1.3.6.2 Finding Studies

##### 4.2.1.3.6.2.1 Proposed Presentation Contexts

Each remote Query/Retrieve SCP peer shall be configured to operate in one of the two standard mode: “Patient Root Query/Retrieve” or “Study Root Query/Retrieve”; a dedicated dialog allows the setup of the operation mode on a per remote server basis.

INDI is capable of proposing the Presentation Contexts shown in the following tables:

**Table 4.2-29**
**Proposed presentation context for INDI Patient Root Q/R IM - FIND**

| Presentation Context Table | | | | | |
|---|---|---|---|---|---|
| **Abstract Syntax** | | **Transfer Syntax** | | **Role** | **Extended** |
| **Name** | **UID** | **Name List** | **UID List** | | **Negotiation** |
| Patient Root Q/R IM – FIND SOP Class | 1.2.840.10008.5.1.4.1.2.1.1 | DICOM Implicit VR Little Endian Transfer Syntax | 1.2.840.10008.1.2 | SCU | None |

**Table 4.2-30**
**Proposed presentation context for INDI Study Root Q/R IM - FIND**

| Presentation Context Table | | | | | |
|---|---|---|---|---|---|
| **Abstract Syntax** | | **Transfer Syntax** | | **Role** | **Extended** |
| **Name** | **UID** | **Name List** | **UID List** | | **Negotiation** |
| Study Root Q/R IM – FIND SOP Class | 1.2.840.10008.5.1.4.1.2.2.1 | DICOM Implicit VR Little Endian Transfer Syntax | 1.2.840.10008.1.2 | SCU | None |

### 4.2.1.3.6.2.2 SOP Specific Conformance Common to all SOP Classes

All the DICOM transfer request and response are logged, together with tags and status details.
The behavior of INDI AE when encountering status codes in a C-FIND response is summarized in the table below:

**Table 4.2-31**
**DICOM Patient/Study Root Q/R IM – FIND**
**Command Response Status Handling Behavior**

| Service Status | Further Meaning | Error Code | Behavior |
|---|---|---|---|
| Success | Success | 0000 | The records received are displayed. |
| Any other error code | | | The results already received up to that point are displayed to the operator and the error reason is shown and logged. |

The behavior of the AE during communication failure is summarized in a table as follows:

**Table 4.2-32**
**DICOM Command Communication Failure Behavior**

| Exception | Behavior |
|---|---|
| Association fail | The results already received up to that point are displayed to the operator and the error reason is shown and logged. |
| Timeout | |
| Association aborted | |

### 4.2.1.3.6.2.3 SOP Specific Conformance of Patient Root Q/R IM – FIND SOP Class

The following tables shows specific attributes.

**Table 4.2-33**
**Patient Root Q/R IM - FIND: Patient level keys**

| Attribute Name | Tag | VR | Matching Type | Presence of Value | Source |
|---|---|---|---|---|---|

| | | | | | |
|---|---|---|---|---|---|
| Patient's Name | (0010,0010) | PN | Single Value matching or Wild Card matching or Universal matching | VNAP | USER |
| Patient ID | (0010,0020) | LO | Single Value matching or Universal matching | VNAP | USER |
| Patient's Birth Date | (0010,0030) | DA | Universal matching | EMPTY | |
| Patient's Sex | (0010,0040) | CS | Universal matching | EMPTY | |

**Table 4.2-34**
**Patient Root Q/R IM - FIND: Study level keys**

| Attribute Name | Tag | VR | Matching Type | Presence of Value | Source |
|---|---|---|---|---|---|
| Study Date | (0008,0020) | DA | Universal matching | EMPTY | |
| Study Time | (0008,0030) | TM | Universal matching | EMPTY | |
| Accession Number | (0008,0050) | SH | Universal matching | EMPTY | |
| Modalities In Study | (0008,0061) | CS | Universal matching | EMPTY | |
| Study Description | (0008,1030) | LO | Universal matching | EMPTY | |
| Patient's Name | (0010,0010) | PN | Single Value matching or Universal matching | VNAP | AUTO |
| Patient ID | (0010,0020) | LO | Single Value matching or Universal matching | VNAP | AUTO |
| Study Instance UID | (0020,000D) | UI | Universal matching | EMPTY | |
| Study ID | (0020,0010) | SH | Universal matching | EMPTY | |
| Number of Study Related Instances | (0020,1208) | IS | Universal matching | EMPTY | |

**Table 4.2-35**
**Patient Root Q/R IM - FIND: Series level keys**

| Attribute Name | Tag | VR | Matching Type | Presence of Value | Source |
|---|---|---|---|---|---|
| Modality | (0008,0060) | CS | Universal matching | EMPTY | |
| Patient ID | (0010,0020) | LO | Single Value matching | VNAP | AUTO |
| Study Instance UID | (0020,000D) | UI | Single Value matching | ALWAYS | AUTO |
| Series Instance UID | (0020,000E) | UI | Universal matching | EMPTY | |
| Series Number | (0020,0011) | IS | Universal matching | EMPTY | |

**Table 4.2-36**
**Patient Root Q/R IM - FIND: Composite Object Instance level keys**

| Attribute Name | Tag | VR | Matching Type | Presence of Value | Source |
|---|---|---|---|---|---|
| SOP Class UID | (0008,0016) | UI | Universal matching | EMPTY | |
| SOP Instance UID | (0008,0018) | UI | Universal matching | EMPTY | |
| Patient ID | (0010,0020) | LO | Single Value matching | VNAP | AUTO |
| Study Instance UID | (0020,000D) | UI | Single Value matching | ALWAYS | AUTO |
| Series Instance UID | (0020,000E) | UI | Single Value matching | ALWAYS | AUTO |
| Instance Number | (0020,0013) | IS | Universal matching | EMPTY | |

#### 4.2.1.3.6.2.4 SOP Specific Conformance of Study Root Q/R IM – FIND SOP Class

The following tables shows specific attributes.

**Table 4.2-37**
**Study Root Q/R IM - FIND: Study level keys**

| Attribute Name | Tag | VR | Matching Type | Presence of Value | Source |
|---|---|---|---|---|---|
| Study Date | (0008,0020) | DA | Universal matching | EMPTY | |
| Study Time | (0008,0030) | TM | Universal matching | EMPTY | |
| Accession Number | (0008,0050) | SH | Universal matching | EMPTY | |
| Modalities In Study | (0008,0061) | CS | Universal matching | EMPTY | |
| Study Description | (0008,1030) | LO | Universal matching | EMPTY | |
| Patient's Name | (0010,0010) | PN | Single Value matching or Wild Card matching or Universal matching | VNAP | USER |
| Patient ID | (0010,0020) | LO | Single Value matching or Universal matching | VNAP | USER |
| Patient's Birth Date | (0010,0030) | DA | Universal matching | EMPTY | |
| Patient's Sex | (0010,0040) | CS | Universal matching | EMPTY | |
| Study Instance UID | (0020,000D) | UI | Universal matching | EMPTY | |
| Study ID | (0020,0010) | SH | Universal matching | EMPTY | |
| Number of Study Related Instances | (0020,1208) | IS | Universal matching | EMPTY | |

**Table 4.2-38**
**Study Root Q/R IM - FIND: Series level keys**

| Attribute Name | Tag | VR | Matching Type | Presence of Value | Source |
|---|---|---|---|---|---|
| Modality | (0008,0060) | CS | Universal matching | EMPTY | |
| Study Instance UID | (0020,000D) | UI | Single Value matching | ALWAYS | AUTO |
| Series Instance UID | (0020,000E) | UI | Universal matching | ALWAYS | AUTO |
| Series Number | (0020,0011) | IS | Universal matching | EMPTY | |

**Table 4.2-39**
**Study Root Q/R IM - FIND: Composite Object Instance level keys**

| Attribute Name | Tag | VR | Matching Type | Presence of Value | Source |
|---|---|---|---|---|---|
| SOP Class UID | (0008,0016) | UI | Universal matching | EMPTY | |
| SOP Instance UID | (0008,0018) | UI | Universal matching | EMPTY | |
| Study Instance UID | (0020,000D) | UI | Single Value matching | ALWAYS | AUTO |
| Series Instance UID | (0020,000E) | UI | Single Value matching | ALWAYS | AUTO |
| Instance Number | (0020,0013) | IS | Universal matching | EMPTY | |

### 4.2.1.3.6.3 Retrieving Studies

#### 4.2.1.3.6.3.1 Proposed Presentation Contexts

Each remote Query/Retrieve SCP peer must be be configured to operate in one of the two standard mode: "Patient Root Query/Retrieve" or "Study Root Query/Retrieve"; a dedicated dialog allows the setup of the operation mode on a per remote server basis.

INDI is capable of proposing the Presentation Contexts shown in the following tables:

**Table 4.2-40**
**Proposed presentation context for INDI Patient Root Q/R IM - MOVE**

| Presentation Context Table |
|---|

| Abstract Syntax | | Transfer Syntax | | Role | Extended |
|---|---|---|---|---|---|
| **Name** | **UID** | **Name List** | **UID List** | | **Negotiation** |
| Patient Root Q/R IM – MOVE SOP Class | 1.2.840.10008.5.1.4.1.2.1.2 | DICOM Implicit VR Little Endian Transfer Syntax | 1.2.840.10008.1.2 | SCU | None |

**Table 4.2-41**
**Proposed presentation context for INDI Study Root Q/R IM - MOVE**

| Presentation Context Table | | | | | |
|---|---|---|---|---|---|
| **Abstract Syntax** | | **Transfer Syntax** | | **Role** | **Extended** |
| **Name** | **UID** | **Name List** | **UID List** | | **Negotiation** |
| Study Root Q/R IM – MOVE SOP Class | 1.2.840.10008.5.1.4.1.2.2.2 | DICOM Implicit VR Little Endian Transfer Syntax | 1.2.840.10008.1.2 | SCU | None |

### 4.2.1.3.6.3.2 SOP Specific Conformance Common to all SOP Classes

All the DICOM transfer request and response are logged, together with tags and status details.
The behavior of INDI AE when encountering status codes in a C-MOVE response is summarized in the table below:

**Table 4.2-42**
**DICOM Patient/Study Root Q/R IM – MOVE**
**Command Response Status Handling Behavior**

| Service Status | Further Meaning | Error Code | Behavior |
|---|---|---|---|
| Success | Success | 0000 | The system wait for image instances to be received in a C-STORE separate association. |
| Any other error code | | | The error reason is shown and logged. |

The behavior of the AE during communication failure is summarized in a table as follows:

**Table 4.2-43**
**DICOM Command Communication Failure Behavior**

| Exception | Behavior |
|---|---|
| Association fail | The error reason is shown and logged. |
| Timeout | |
| Association aborted | |

### 4.2.1.3.6.3.3 SOP Specific Conformance of Patient Root Q/R IM – MOVE SOP Class

The following tables shows specific attributes.

**Table 4.2-44**
**Patient Root Q/R IM - MOVE: Study level keys**

| Attribute Name | Tag | VR | Matching Type | Presence of Value | Source |
|---|---|---|---|---|---|
| Patient ID | (0010,0020) | LO | Single Value matching | ALWAYS | AUTO |
| Study Instance UID | (0020,000D) | UI | Single Value matching | ALWAYS | AUTO |

**Table 4.2-45**
**Patient Root Q/R IM - MOVE: Series level keys**

| Attribute Name | Tag | VR | Matching Type | Presence of Value | Source |
|---|---|---|---|---|---|
| Patient ID | (0010,0020) | LO | Single Value matching | ALWAYS | AUTO |
| Study Instance UID | (0020,000D) | UI | Single Value matching | ALWAYS | AUTO |
| Series Instance UID | (0020,000E) | UI | Single Value matching | ALWAYS | AUTO |

**Table 4.2-46**
**Patient Root Q/R IM - MOVE: Composite Object Instance level keys**

| Attribute Name | Tag | VR | Matching Type | Presence of Value | Source |
|---|---|---|---|---|---|
| SOP Instance UID | (0008,0018) | UI | Single Value matching | ALWAYS | AUTO |
| Patient ID | (0010,0020) | LO | Single Value matching | ALWAYS | AUTO |
| Study Instance UID | (0020,000D) | UI | Single Value matching | ALWAYS | AUTO |
| Series Instance UID | (0020,000E) | UI | Single Value matching | ALWAYS | AUTO |

#### 4.2.1.3.6.3.4 SOP Specific Conformance of Study Root Q/R IM – MOVE SOP Class

The following tables shows specific attributes.

**Table 4.2-47**
**Study Root Q/R IM - MOVE: Study level keys**

| Attribute Name | Tag | VR | Matching Type | Presence of Value | Source |
|---|---|---|---|---|---|
| Study Instance UID | (0020,000D) | UI | Single Value matching | ALWAYS | AUTO |

**Table 4.2-48**
**Study Root Q/R IM - MOVE: Series level keys**

| Attribute Name | Tag | VR | Matching Type | Presence of Value | Source |
|---|---|---|---|---|---|
| Study Instance UID | (0020,000D) | UI | Single Value matching | ALWAYS | AUTO |
| Series Instance UID | (0020,000E) | UI | Single Value matching | ALWAYS | AUTO |

**Table 4.2-49**
**Study Root Q/R IM - MOVE: Composite Object Instance level keys**

| Attribute Name | Tag | VR | Matching Type | Presence of Value | Source |
|---|---|---|---|---|---|
| SOP Instance UID | (0008,0018) | UI | Single Value matching | ALWAYS | AUTO |
| Study Instance UID | (0020,000D) | UI | Single Value matching | ALWAYS | AUTO |
| Series Instance UID | (0020,000E) | UI | Single Value matching | ALWAYS | AUTO |

### 4.2.1.4 Association Acceptance Policy

#### 4.2.1.4.1 Activity – Receive Storage Commitment Response from a Remote Server

##### 4.2.1.4.1.1 Description and Sequencing of Activities

INDI accept Storage Commitment Response (conveyed on a N-EVENT-REPORT command) from a Remote SCP only on an association separate from the original one. The new association must be started by SCP entity. On receiving a Storage Commitment Response the related transaction is removed from outstanding queue and the associated image is marked as committed.

#### 4.2.1.4.1.2 Accepted Presentation Contexts

INDI is capable of accepting the Presentation Contexts shown in the following table:

**Table 4.2-50**
**Accepted Presentation Contexts for INDI Storage Commitment**

| Presentation Context Table | | | | | |
|---|---|---|---|---|---|
| **Abstract Syntax** | | **Transfer Syntax** | | **Role** | **Extended** |
| **Name** | **UID** | **Name List** | **UID List** | | **Negotiation** |
| Storage Commitment SOP Class | 1.2.840.10008.2.20 .1 | DICOM Implicit VR Little Endian Transfer Syntax | 1.2.840.10008.1.2 | SCU | None |

#### 4.2.1.4.1.3 SOP Specific Conformance of Storage Commitment SOP Class

All the DICOM transfer request and response are logged, together with tags and status details.

- **N-EVENT-REPORT** command

The behavior and the response status of INDI following a N-EVENT-REPORT request is shown in the following table:

**Table 4.2-51**
**DICOM Storage Commitment N-EVENT-REPORT**
**Returned Status and Actions**

| Service Status | Further Meaning | Error Code | Behavior |
|---|---|---|---|
| Success | Success | 0000 | If the transaction is still active and the commitment has been accepted, the images listed in the transaction are marked as commited and can be deleted (if the option “enable deleting image only if storage commited” is set).<br>For all refused commitment, related transaction is marked as failed.<br>Any transaction will be retried after a programmable delay and for a programmable number of times. |

INDI support specific attributes in a received N-EVENT-REPORT as shown in the following table:

**Table 4.2-52**
**Storage Commitment N-EVENT-REPORT accepted attributes**

| Attribute Name | Tag | VR | Value |
|---|---|---|---|
| Specific character set | (0008,0005) | CS | |
| Retrieve AE Title | (0008,0054) | AE | |
| Transaction UID | (0008,1195) | UI | |
| Failed SOP Sequence | (0008,1198) | SQ | |
| > Referenced SOP Class UID | (0008,1150) | UI | |
| > Reference SOP Instance UID | (0008,1155) | UI | |
| > Failure Reason | (0008,1197) | US | |
| Referenced SOP Sequence | (0008,1199) | SQ | |
| > Retrieve AE Title | (0008,0054) | AE | |
| > Referenced SOP Class UID | (0008,1150) | UI | |
| > Reference SOP Instance UID | (0008,1155) | UI | |
| > Storage Media File-Set ID | (0088,0130) | SH | |
| > Storage Media File-Set UID | (0088,0140) | UI | |

| | | | |
|---|---|---|---|
| Storage Media File-Set ID | (0088,0130) | SH | |
| Storage Media File-Set UID | (0088,0140) | UI | |

#### 4.2.1.4.2 Activity – Receive Remote Image instances

##### 4.2.1.4.2.1 Description and Sequencing of Activities

The reception of images on a C-STORE association is enabled only as an activity following a Query/Retrieve C-MOVE command. Images are stored in system archive and grouped in studies to be displayed.

##### 4.2.1.4.2.2 Accepted Presentation Contexts

INDI is capable of accepting the Presentation Contexts shown in the following table:

**Table 4.2-53**
**Accepted Presentation Contexts for INDI Storage**

| Presentation Context Table | | | | | |
|---|---|---|---|---|---|
| **Abstract Syntax** | | **Transfer Syntax** | | **Role** | **Extended** |
| **Name** | **UID** | **Name List** | **UID List** | | **Negotiation** |
| Computed Radiography Image Storage SOP Class | 1.2.840.10008.5.1.4.1.1.1 | DICOM Implicit VR Little Endian Transfer Syntax | 1.2.840.10008.1.2 | SCP | None |
| Digital X-Ray Image Storage – For Presentation SOP Class | 1.2.840.10008.5.1.4.1.1.1.1 | DICOM Implicit VR Little Endian Transfer Syntax | 1.2.840.10008.1.2 | SCP | None |
| X-Ray Angiographic Image Storage SOP Class | 1.2.840.10008.5.1.4.1.1.12.1 | Jpeg Lossless non-hirarchical,First-order Prediction P14 Transfer Syntax | 1.2.840.10008.1.2.4.70 | SCP | None |
| X-Ray Radiofluoroscopic Image Storage SOP Class | 1.2.840.10008.5.1.4.1.1.12.2 | Jpeg Lossless non-hirarchical,First-order Prediction P14 Transfer Syntax | 1.2.840.10008.1.2.4.70 | SCP | None |

##### 4.2.1.4.2.3 SOP Specific Conformance of Storage SOP Classes

All the DICOM transfer request and response are logged, together with tags and status details.
The behavior and the response status of INDI following a C-STORE request is shown in the following table:

**Table 4.2-54**
**DICOM C-STORE Returned Status and Actions**

| Service Status | Further Meaning | Error Code | Behavior |
|---|---|---|---|
| Success | Success | 0000 | The image instance is store on disk in Dicom Media format. All DICOM attributes received are inserted in the saved image IOD. |

### 4.3 Network Interfaces

#### 4.3.1 Physical Network Interface

INSIDE_SW provides TCP/IP Network Communication Support as defined in Part 8 of the DICOM Standard. The application uses TCP/IP stack of the operating system where it runs.

### 4.3.2 Additional Protocols

None.

### 4.3.3 IPv4 and IPv6 Support

INSIDE_SW supports IPv4 only.

## 4.4 Configuration

A number of operating parameters can be configured by the operator. The " INSIDE_SW User Manual" describes how to setup network information and communication parameters from the "DICOM Setup dialog".

### 4.4.1 AE Title/Presentation Address Mapping

#### 4.4.1.1 Local AE Title.

The following table specifies the local AET mapping and configuration:

**Table 4.4-1**
**Local AE programming**

| Application Entity | Default AE Title | Default TCP/IP Port |
|---|---|---|
| INDI | INSIDE_SWDICOM | 104 |

#### 4.4.1.2 Remote AE Title/Presentation Address Mapping

A maximum of 30 remote AE can be configured. For each one the user shall specify AET, IP address, port number and the capabilities as SCP/SCU.

For each hardcopy printer model supported an xml configuration file details the supported value of printing attributes (medium types, film sizes, film formats etc.).

# 5 MEDIA INTERCHANGE

Digitec INSIDE_SW is equipped with a *INSIDE_SW Media Storage Interface* (IMSI) that allows the creation of a CD-R/DVD file-set according with DICOM 3.0 standard.

This document describes the conformance of IMSI to DICOM 3.0 standard.

## 5.1 Implementation Model

IMSI is an application capable to convert local storage images in a file set on a study base and to write the file set to a CD-R or to a DVD.

### 5.1.1 Application Data Flow Diagram

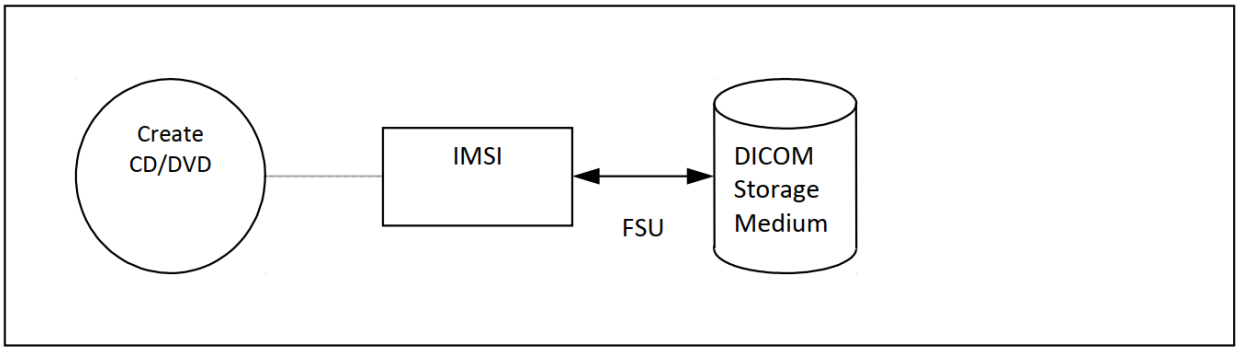



**Figure 5.1-1.**
**Application Data Flow Diagram**

### 5.1.2 Functional definitions of AE's

The user starts the creation of a file-set by means of a dedicated command. The minimum data unit selectable is the study.

### 5.1.3 Sequencing of Real World Activities

Not applicable.

### 5.1.4 File Meta Information for Implementation Class and Version

The implementation information written to the File Meta Header in each file is:

**Table 5.1-1**
**DICOM Implementation Class and Version for IMSI**

| | |
|---|---|
| Implementation Class UID | 1.3.76.6.1.1.5.1.1 |
| Implementation Version Name | DIGITEC V5.1 |

## 5.2 AE Specifications

### 5.2.1 IMSI AE Specification

IMSI provides standard conformance to DICOM Interchange Option of the of the Media Storage Service Class. The Application Profiles and roles are listed in Table 5.2-1.

**Table 5.2-1**
**Application Profiles, Activities and Roles for IMSI**

| Application Profiles supported | Real World Activity | Role | SC Option |
|---|---|---|---|
| AUG-GEN-CD | Create CD | FSC | Interchange |
| STD-GEN-DVD | Create DVD | FSC | Interchange |

#### 5.2.1.1 File Meta Information for the IMSI AE

The Source AET is set by the user in the DICOM Setup dialog.

#### 5.2.1.2 Real-World Activities

##### 5.2.1.2.1 Real-World Activity: "Create CD/DVD"

IMSI acts as an FSC using the Interchange Option when requested to create a new CD/DVD.

IMSI uses all the SOP Instances of the selected study to build a file-set to be written to the media. A corresponding DICOMDIR is created and the file set is written to an empty CD-R/DVD.

##### 5.2.1.2.1.1 Media Storage Application Profile

The Application Profiles used by IMSI for "Create CD/DVD" RWA are listed in table 5.2-1. Profile AUG-GEN-CD is an extension of the standard profile STD-GEN-CD.

IMSI automatically selects the Application Profile corresponding to the physical medium to be written.

##### 5.2.1.2.1.1.1 Options

Table 5.2-2 defines IOD and Transfer Syntax used in STD-GEN-DVD profile:

**Table 5.2-2**
**IOD and Transfer Syntax for STD-GEN-DVD**

| Information Object Definition | SOP Class UID | Transfer Syntax | Transfer Syntax UID |
|---|---|---|---|
| Basic Directory | 1.2.840.10008.1.3.10 | Explicit VR Little Endian Uncompressed | 1.2.840.10008.1.2.1 |
| Computed Radiography Image Storage | 1.2.840.10008.5.1.4.1.1.1 | Explicit VR Little Endian Uncompressed | 1.2.840.10008.1.2.1 |
| Digital X-Ray Image Storage – For Presentation | 1.2.840.10008.5.1.4.1.1.1.1 | Explicit VR Little Endian Uncompressed | 1.2.840.10008.1.2.1 |
| X-Ray Angiographic Image | 1.2.840.10008.5.1.4.1.1.12.1 | Jpeg Lossless Process 14 (selection value 1) | 1.2.840.10008.1.2.4.70 |
| X-Ray Radiofluroscopic Image | 1.2.840.10008.5.1.4.1.1.12.2 | Jpeg Lossless Process 14 (selection value 1) | 1.2.840.10008.1.2.4.70 |
| X-Ray Radiation Dose SR Storage | 1.2.840.10008.5.1.4.1.1.88.67 | Explicit VR Little Endian Uncompressed | 1.2.840.10008.1.2.1 |

### 5.3 Augmented and Private Application Profiles

#### 5.3.1 Augmented Application Profiles

IMSI supports the augmented profile AUG-GEN-CD.

#### 5.3.1.1 AUG-GEN-CD

This Application Profile is an augmentation of the STD-GEN-CD Standard Application profile defined in PS 3.11. The augmentations add support for Jpeg Lossless Process 14 Transfer Syntax for XA and XRF SOP Classes.

#### 5.3.1.1.1 SOP Class Augmentations

The following IODs are part of the AUG-GEN-CD. There are no requirements or restrictions on SOP options for these IODs beyond those in their standard definitions.

**Table 5.3-1**
**IOD and Transfer Syntax for AUG-GEN-CD**

| Information Object Definition | SOP Class UID | Transfer Syntax | Transfer Syntax UID |
|---|---|---|---|
| Basic Directory | 1.2.840.10008.1.3.10 | Explicit VR Little Endian Uncompressed | 1.2.840.10008.1.2.1 |
| Computed Radiography Image Storage | 1.2.840.10008.5.1.4.1.1.1 | Explicit VR Little Endian Uncompressed | 1.2.840.10008.1.2.1 |
| Digital X-Ray Image Storage – For Presentation | 1.2.840.10008.5.1.4.1.1.1.1 | Explicit VR Little Endian Uncompressed | 1.2.840.10008.1.2.1 |
| X-Ray Angiographic Image | 1.2.840.10008.5.1.4.1.1.12.1 | Jpeg Lossless Process 14 (selection value 1) | 1.2.840.10008.1.2.4.70 |
| X-Ray Radiofluroscopic Image | 1.2.840.10008.5.1.4.1.1.12.2 | Jpeg Lossless Process 14 (selection value 1) | 1.2.840.10008.1.2.4.70 |
| X-Ray Radiation Dose SR Storage | 1.2.840.10008.5.1.4.1.1.88.67 | Explicit VR Little Endian Uncompressed | 1.2.840.10008.1.2.1 |

This Application Profile does not place any further restrictions on options or extensions for any of these SOP classes. Any otherwise permissible SOP instance is acceptable for the AUG-GEN-CD profile.

#### 5.3.1.1.2 Directory Augmentations

There are no additional directory keys, records, or options as part of this profile.

#### 5.3.1.1.3 Other Augmentations

None.

### 5.3.2 Private Application Profiles

None.

## 5.4 Media Configuration

A number of operating parameters can be configured by the operator. The " INSIDE_SW User Manual" describes how to setup media storage parameters from the "DICOM Setup dialog".

Configurable parameters are for example:

- source AET

## 6 SUPPORT OF CHARACTER SETS

The following specific character set are supported and are selectable:

- ISO-IR 100 Latin 1
- ISO-IR 101 Latin 2
- ISO-IR 109 Latin 3
- ISO-IR 110 Latin 4
- ISO-IR 144 Cyrillic
- ISO-IR 127 Arab
- ISO-IR 126 Greek
- ISO-IR 138 Hebrew
- ISO-IR 148 Latin 5
- ISO-IR 192 Unicode UTF-8

## 7 SECURITY

INSIDE_SW does not support any specific security measures. It is assumed that INSIDE_SW is used within a secured environment.

It is assumed that a secured environment includes at a minimum:

- Firewall or router protections to ensure that only approved external hosts have network access to INSIDE_SW.
- Firewall or router protections to ensure that INSIDE_SW only has network access to approved external hosts and services.
- Any communication with external hosts and services outside the locally secured environment use appropriate secure network channels (e.g. such as a Virtual Private Network (VPN))

Other network security procedures such as automated intrusion detection may be appropriate in some environments. Additional security features may be established by the local security policy and are beyond the scope of this conformance statement.

# 8 ANNEXES

## 8.1 IOD Contents

### 8.1.1 Created SOP Instance(s)

Tables 8.1-1 to 8.1-5 specifie the attributes of CR/DX/XA/XRF Image and X-Ray Radiation Dose SR IODs transmitted by the INDI storage AE or written by the IMSI media storage creation AE.

**Table 8.1-1**
**IOD of Created "CR Image" instances**

| Module | Reference | Presence of Module |
|---|---|---|
| Patient | Table 8.1-8 | ALWAYS |
| General Study | Table 8.1-9 | ALWAYS |
| Patient Study | Table 8.1-10 | ALWAYS |
| General Series | Table 8.1-11 | ALWAYS |
| CR Series | Table 8.1-12 | ALWAYS |
| General Equipment | Table 8.1-23 | ALWAYS |
| General Image | Table 8.1-15 | ALWAYS |
| Image Pixel | Table 8.1-16 | ALWAYS |
| Contrast/bolus | Table 8.1-25 | ALWAYS |
| X-Ray Collimator | Table 8.1-28 | ALWAYS |
| CR Image | Table 8.1-17 | ALWAYS |
| X-Ray Acquisition Dose | Table 8.1-34 | MNAP |
| X-Ray Filtration | Table 8.1-36 | ALWAYS |
| X-Ray Grid | Table 8.1-37 | ALWAYS |
| VOI LUT | Table 8.1-38 | ALWAYS |
| Imaging Service Request | Table 8.1-40 | MNAP |
| SOP Common | Table 8.1-7 | ALWAYS |
| *Any other Module of this IOD* | (never present in current implementation) | |

**Table 8.1-2**
**IOD of Created "Digital X-Ray Image" instances**

| Module | Reference | Presence of Module |
|---|---|---|
| Patient | Table 8.1-8 | ALWAYS |
| General Study | Table 8.1-9 | ALWAYS |
| Patient Study | Table 8.1-10 | ALWAYS |
| General Series | Table 8.1-11 | ALWAYS |
| DX Series | Table 8.1-13 | ALWAYS |
| General Equipment | Table 8.1-23 | ALWAYS |
| General Image | Table 8.1-15 | ALWAYS |
| Image Pixel | Table 8.1-16 | ALWAYS |
| Contrast/Bolus | Table 8.1-25 | ALWAYS |
| DX Anatomy Imaged | Table 8.1-18 | ALWAYS |
| DX Image | Table 8.1-19 | ALWAYS |
| DX Detector | Table 8.1-26 | ALWAYS |
| X-Ray Collimator | Table 8.1-28 | ALWAYS |
| DX Positioning | Table 8.1-29 | ALWAYS |
| X-Ray Tomo Acquisition | Table 8.1-32 | MNAP |
| X-Ray Acquisition Dose | Table 8.1-34 | MNAP |
| X-Ray Generation | Table 8.1-35 | MNAP |
| X-Ray Filtration | Table 8.1-36 | ALWAYS |

| | | |
|---|---|---|
| X-Ray Grid | Table 8.1-37 | ALWAYS |
| VOI LUT | Table 8.1-38 | ALWAYS |
| Acquisition Context | Table 8.1-39 | ALWAYS |
| Imaging Service Request | Table 8.1-40 | MNAP |
| SOP Common | Table 8.1-7 | ALWAYS |
| *Any other Module of this IOD* | (never present in current implementation) | |

**Table 8.1-3**
**IOD of Created "XA Image" instances**

| **Module** | **Reference** | **Presence of Module** |
|---|---|---|
| Patient | Table 8.1-8 | ALWAYS |
| General Study | Table 8.1-9 | ALWAYS |
| Patient Study | Table 8.1-10 | ALWAYS |
| General Series | Table 8.1-11 | ALWAYS |
| General Equipment | Table 8.1-23 | ALWAYS |
| General Image | Table 8.1-15 | ALWAYS |
| Image Pixel | Table 8.1-16 | ALWAYS |
| Contrast/bolus | Table 8.1-25 | ALWAYS |
| Cine | Table 8.1-21 | ALWAYS |
| Multi-Frame | Table 8.1-22 | ALWAYS |
| X-Ray Image | Table 8.1-20 | ALWAYS |
| X-Ray Acquisition | Table 8.1-33 | ALWAYS |
| X-Ray Collimator | Table 8.1-28 | ALWAYS |
| X-Ray Table | Table 8.1-27 | MNAP |
| XA Positioner | Table 8.1-30 | ALWAYS |
| DX Detector | Table 8.1-26 | ALWAYS |
| X-Ray Filtration | Table 8.1-36 | ALWAYS |
| X-Ray Grid | Table 8.1-37 | ALWAYS |
| VOI LUT | Table 8.1-38 | ALWAYS |
| Imaging Service Request | Table 8.1-40 | MNAP |
| SOP Common | Table 8.1-7 | ALWAYS |
| *Any other Module of this IOD* | (never present in current implementation) | |

**Table 8.1-4**
**IOD of Created "XRF Image" instances**

| **Module** | **Reference** | **Presence of Module** |
|---|---|---|
| Patient | Table 8.1-8 | ALWAYS |
| General Study | Table 8.1-9 | ALWAYS |
| Patient Study | Table 8.1-10 | ALWAYS |
| General Series | Table 8.1-11 | ALWAYS |
| General Equipment | Table 8.1-23 | ALWAYS |
| General Image | Table 8.1-15 | ALWAYS |
| Image Pixel | Table 8.1-16 | ALWAYS |
| Contrast/bolus | Table 8.1-25 | ALWAYS |
| Cine | Table 8.1-21 | ALWAYS |
| Multi-Frame | Table 8.1-22 | ALWAYS |
| X-Ray Image | Table 8.1-20 | ALWAYS |
| X-Ray Acquisition | Table 8.1-33 | ALWAYS |
| X-Ray Collimator | Table 8.1-28 | ALWAYS |
| X-Ray Table | Table 8.1-27 | MNAP |
| XRF Positioner | Table 8.1-31 | ALWAYS |

| | | |
|---|---|---|
| X-Ray Tomo Acquisition | Table 8.1-32 | MNAP |
| DX Detector | Table 8.1-26 | ALWAYS |
| X-Ray Filtration | Table 8.1-36 | ALWAYS |
| X-Ray Grid | Table 8.1-37 | ALWAYS |
| VOI LUT | Table 8.1-38 | ALWAYS |
| Imaging Service Request | Table 8.1-40 | MNAP |
| SOP Common | Table 8.1-7 | ALWAYS |
| *Any other Module of this IOD* | (never present in current implementation) | |

**Table 8.1-5**
**IOD of Created "X-Ray Radiation Dose SR" instances**

| Module | Reference | Presence of Module |
|---|---|---|
| SOP Common | Table 8.1-7 | ALWAYS |
| Patient | Table 8.1-8 | ALWAYS |
| General Study | Table 8.1-9 | ALWAYS |
| Patient Study | Table 8.1-10 | ALWAYS |
| SR Document Series | Table 8.1-14 | ALWAYS |
| General Equipment | Table 8.1-23 | ALWAYS |
| Enhanced General Equipment | Table 8.1-24 | ALWAYS |
| SR Document General | Table 8.1-41 | ALWAYS |
| SR Document Content | Table 8.1-42 | ALWAYS |

In the following tables, some groups of attributes are defined as macro. Macro are expanded as defined in DICOM Standard PS3.3-2015a. Some macro are detailed in the current document too, with the purpose to specify the presence of the items in the IOD generated. The syntaxes of the macro used are (possibly nested):

| Macro name | Short Name | Parameters |
|---|---|---|
| SOP Instance Reference Macro | SOPMc (DICOM Standard PS3.3-2015a Table 10-11) | (SOPClassUID, SOPInstanceUID) |
| Image SOP Instance Reference Macro | ImgSOPMc (DICOM Standard PS3.3-2015a Table 10-3) | (*SOPMc,* ReferencedFrameNumber) |
| Hierarchical SOP Instance Reference Macro | HrcSOPMc (DICOM Standard PS3.3-2015a Table C.17-3) | (StudyUID,SeriesUID,*SOPMc*-SOPInstanceReference) |
| Code Sequence Macro | CdMc (DICOM Standard PS3.3-2015a Table 8.8-1) | (CodeValue, CodeMeaning, CodingSchemeDesignator , CodeSchemeVersion ) |
| Person Identification Macro | PIdMc (DICOM Standard PS3.3-2015a Table 10-1) | (*CdMc*-PersonID, PersonAddr, PersonTelNum, *CdMc*-Institution, InstitutionName, InstitutionAddr ) |
| Image Pixel Macro Attribute | ImgPxMc | See table 8.1-6 |

**Table 8.1-6**
**Image Pixel Macro Attributes**

| Attribute Name | Tag | VR | Value | Presence of Value | Source |
|---|---|---|---|---|---|
| Samples per Pixel | (0028,0002) | US | "1" | ALWAYS | FIX |
| Photometric Interpretation | (0028,0004) | CS | "MONOCHROME2" (AUTO for DX IOD) | ALWAYS | FIX/AUTO |
| Rows | (0028,0010) | US | | ALWAYS | AUTO |
| Columns | (0028,0011) | US | | ALWAYS | AUTO |
| Pixel Aspect Ratio | (0028,0034) | IS | "1\1" | ALWAYS | FIX |

| | | | | | |
|---|---|---|---|---|---|
| Bits Allocated | (0028,0100) | US | | ALWAYS | CONFIG |
| Bits Stored | (0028,0101) | US | | ALWAYS | CONFIG |
| High Bit | (0028,0102) | US | | ALWAYS | CONFIG |
| Pixel Representation | (0028,0103) | US | "0" | ALWAYS | FIX |
| Smallest Image Pixel Value | (0028,0106) | US | (never present in current implementation) | | |
| Largest Image Pixel Value | (0028,0107) | US | (never present in current implementation) | | |
| Pixel Data | (7FE0,0010) | OB/ OW | | ALWAYS | AUTO |
| *Any other Attribute of this Module* | | | (never present in current implementation) | | |

The following tables list the attributes specific to every module included in the IODs of the instances created by network and media application entities.

**Table 8.1-7**
**SOP Common Module**

| Attribute Name | Tag | VR | Value | Presence of Value | Source |
|---|---|---|---|---|---|
| Specific Character Set | (0008,0005) | CS | | ANAP | CONFIG |
| SOP Class UID | (0008,0016) | UI | | ALWAYS | AUTO |
| SOP Instance UID | (0008,0018) | UI | | ALWAYS | AUTO |
| Instance Creator UID | (0008,0014) | UI | (never present in current implementation) | | |
| *Any other Attribute of this Module* | | | (never present in current implementation) | | |

**Table 8.1-8**
**Patient Module**

| Attribute Name | Tag | VR | Value | Presence of Value | Source |
|---|---|---|---|---|---|
| Patient's Name | (0010,0010) | PN | | VNAP | MWL/ USER |
| Patient ID | (0010,0020) | LO | | VNAP | MWL/ USER |
| Patient's Birth Date | (0010,0030) | DA | | VNAP | MWL/ USER |
| Patient's Sex | (0010,0040) | CS | | VNAP | MWL/ USER |
| Other Patient IDs | (0010,1000) | LO | (never present in current implementation) | | |
| Other Patient Names | (0010,1001) | PN | (never present in current implementation) | | |
| Ethnic Group | (0010,2160) | SH | (never present in current implementation) | | |
| *Any other Attribute of this Module* | | | (never present in current implementation) | | |

**Table 8.1-9**
**General Study Module**

| Attribute Name | Tag | VR | Value | Presence of Value | Source |
|---|---|---|---|---|---|
| Study Date | (0008,0020) | DA | | VNAP | AUTO |
| Study Time | (0008,0030) | TM | | VNAP | AUTO |
| Accession Number | (0008,0050) | SH | | VNAP | MWL/ USER |
| Referring Physician's Name | (0008,0090) | PN | | VNAP | MWL/ USER |
| Referring Physician Identification Sequence | (0008,0096) | SQ | *PIdMc* (never present in current implementation) | | |

| | | | | | |
|---|---|---|---|---|---|
| Study Description | (0008,1030) | LO | | ANAP | MWL/ USER |
| Procedure Code Sequence | (0008,1032) | SQ | *CdMc* | ANAP | MWL |
| Physician(s) of Records | (0008,1048) | PN | (never present in current implementation) | | |
| Physician(s) of Records Identification Sequence | (0008,1049) | SQ | *PIdMc* (never present in current implementation) | | |
| Name of Physician(s) Reading Study | (0008,1060) | PN | (never present in current implementation) | | |
| Name of Physician(s) Reading Study Identification Sequence | (0008,1062) | SQ | *PIdMc* (never present in current implementation) | | |
| Referenced Study Sequence | (0008,1110) | SQ | *SOPMc* | ANAP | MWL |
| Study Instance UID | (0020,000D) | UI | | ALWAYS | MWL/ AUTO |
| Study ID | (0020,0010) | SH | | VNAP | MWL/ USER |
| Requesting Service Code Sequence | (0032,1034) | SQ | *CdMc* (never present in current implementation) | | |
| Reason for Performed Procedure Code Sequence | (0040,1012) | SQ | *CdMc* (never present in current implementation) | | |
| *Any other Attribute of this Module* | | | (never present in current implementation) | | |

**Table 8.1-10**
**Patient Study Module**

| Attribute Name | Tag | VR | Value | Presence of Value | Source |
|---|---|---|---|---|---|
| Patient's Age | (0010,1010) | AS | | ANAP | MWL/ USER |
| Patient's Size | (0010,1020) | DS | | ANAP | MWL/ USER |
| Patient's Size Code Sequence | (0010,1021) | SQ | *CdMc* | ANAP | MWL/ USER |
| Patient's Weight | (0010,1030) | DS | | ANAP | MWL/ USER |
| Occupation | (0010,2180) | SH | (never present in current implementation) | | |
| *Any other Attribute of this Module* | | | (never present in current implementation) | | |

**Table 8.1-11**
**General Series Module**

| Attribute Name | Tag | VR | Value | Presence of Value | Source |
|---|---|---|---|---|---|
| Series Date | (0008,0021) | DA | | VNAP | AUTO |
| Series Time | (0008,0031) | TM | | VNAP | AUTO |
| Modality | (0008,0060) | CS | Respect. “CR”, ”DX”, ”XA”, ”RF”, ”SR” | ALWAYS | FIX |
| Series Description | (0008,103E) | LO | | VNAP | AUTO |
| Series Description Code Sequence | (0008,103F) | SQ | *CdMc* (never present in current implementation) | | |
| Performing Physicians’ Name | (0008,1050) | PN | (never present in current implementation) | | |
| Performing Physician Identification Sequence | (0008,1052) | SQ | *PIdMc* (never present in current implementation) | | |
| Operators' Name | (0008,1070) | PN | (never present in current implementation) | | |
| Operator Identification Sequence | (0008,1072) | SQ | *PIdMc* (never present in current implementation) | | |
| Referenced Performed Procedure Step Sequence | (0008,1111) | SQ | *SOPMc* | ANAP | AUTO |
| Body Part Examined | (0018,0015) | CS | | VNAP | MWL/ USER |

| | | | | | |
|---|---|---|---|---|---|
| Protocol Name | (0018,1030) | LO | | ANAP | MWL/ USER |
| Patient Position | (0018,5100) | CS | (never present in current implementation) | | |
| View Position | (0018,5101) | CS | | VNAP | MWL/ USER |
| Series Instance UID | (0020,000E) | UI | | ALWAYS | AUTO |
| Series Number | (0020,0011) | IS | | VNAP | AUTO |
| Laterality | (0020,0060) | CS | Absent in DX IOD | VNAP | AUTO/ USER |
| Performed Procedure Step Start Date | (0040,0244) | DA | 3 | ANAP | AUTO |
| Performed Procedure Step Start Time | (0040,0245) | TM | 3 | ANAP | AUTO |
| Performed Procedure Step ID | (0040,0253) | SH | 3 | ANAP | MWL/ USER |
| Performed Procedure Step Description | (0040,0254) | LO | 3 | ANAP | MWL/ USER |
| Performed Protocol Code Sequence | (0040,0260) | SQ | *CdMc* 3 | ANAP | MWL/ USER |
| Request Attribute Sequence | (0040,0275) | SQ | 3 | ANAP | AUTO |
| > Requested Procedure Description | (0032,1060) | LO | | VNAP | MWL/ USER |
| > Requested Procedure Code Sequence | (0032,1064) | SQ | *CdMc* (never present in current implementation) | | |
| > Scheduled Procedure Step Description | (0040,0007) | LO | | VNAP | MWL/ USER |
| > Scheduled Protocol Code Sequence | (0040,0008) | SQ | *CdMc* | VNAP | MWL/ USER |
| > Scheduled Procedure Step ID | (0040,0009) | SH | | VNAP | MWL/ USER |
| > Requested Procedure ID | (0040,1001) | SH | | VNAP | MWL/ USER |
| *Any other Attribute of this Module* | | | (never present in current implementation) | | |

**Table 8.1-12**
**CR Series Module**

| Attribute Name | Tag | VR | Value | Presence of Value | Source |
|---|---|---|---|---|---|
| Body Part Examined | (0018,0015) | CS | | VNAP | MWL/ USER |
| Filter Type | (0018,1160) | SH | | VNAP | AUTO |
| Collimator/grid Name | (0018,1180) | SH | (never present in current implementation) | | |
| Focal Spot | (0018,1190) | DS | (never present in current implementation) | | |
| Plate Type | (0018,1260) | SH | (never present in current implementation) | | |
| Phosphor Type | (0018,1261) | LO | (never present in current implementation) | | |
| View Position | (0018,5101) | CS | | VNAP | MWL/ USER |
| *Any other Attribute of this Module* | | | (never present in current implementation) | | |

**Table 8.1-13**
**DX Series Module**

| Attribute Name | Tag | VR | Value | Presence of Value | Source |
|---|---|---|---|---|---|
| Modality | (0008,0060) | CS | "DX" | ALWAYS | FIX |
| Presentation Intent Type | (0008,0068) | CS | "FOR PRESENTATION" | ALWAYS | FIX |

| | | | | | |
|---|---|---|---|---|---|
| Referenced Performed Procedure Step Sequence | (0008,1111) | SQ | *SOPMc* | ANAP | AUTO |
| *Any other Attribute of this Module* | | | (never present in current implementation) | | |

**Table 8.1-14**
**SR Document Series Module**

| Attribute Name | Tag | VR | Value | Presence of Value | Source |
|---|---|---|---|---|---|
| Series Date | (0008,0021) | DA | | ANAP | AUTO |
| Series Time | (0008,0031) | TM | | ANAP | AUTO |
| Modality | (0008,0060) | CS | "SR" | ALWAYS | FIX |
| Series Description | (0008,103E) | LO | | EMPTY | |
| Series Description Code Sequence | (0008,103F) | SQ | *CdMc* (never present in current implementation) | | |
| Referenced Performed Procedure Step Sequence | (0008,1111) | SQ | *SOPMc* | EMPTY | |
| Series Instance UID | (0020,000E) | UI | | ALWAYS | AUTO |
| Series Number | (0020,0011) | IS | | ALWAYS | AUTO |
| *Any other Attribute of this Module* | | | (never present in current implementation) | | |

**Table 8.1-15**
**General Image Module**

| Attribute Name | Tag | VR | Value | Presence of Value | Source |
|---|---|---|---|---|---|
| Image Type | (0008,0008) | CS | "DERIVED\PRIMARY" | ALWAYS | FIX |
| Acquisition Date | (0008,0022) | DA | | VNAP | AUTO |
| Content Date | (0008,0023) | DA | | VNAP | AUTO |
| Acquisition DateTime | (0008,002A) | DT | (never present in current implementation) | | |
| Acquisition Time | (0008,0032) | TM | | VNAP | AUTO |
| Content Time | (0008,0033) | TM | | VNAP | AUTO |
| Referenced Image Sequence | (0008,1140) | SQ | *ImgSOPMc* (never present in current implementation) | | |
| >Purpose of Reference Code Sequence | (0040,A170) | SQ | *CdMc-CID 7201* (never present in current implementation) | | |
| Referenced Instance Sequence | (0008,114A) | SQ | (never present in current implementation) | | |
| Derivation Description | (0008,2111) | ST | (never present in current implementation) | | |
| Source Image Sequence | (0008,2112) | SQ | *ImgSOPMc* | ANAP | AUTO |
| >Purpose of Reference Code Sequence | (0040,A170) | SQ | *CdMc-CID 7202* (never present in current implementation) | | |
| >Patient Orientation | (0020,0020) | CS | (never present in current implementation) | | |
| >Spatial Locations Preserved | (0028,135A) | CS | (never present in current implementation) | | |
| Irradiation Event UID | (0008,3010) | UI | | ANAP | AUTO |
| Derivation Code Sequence | (0008,9215) | SQ | *CdMc-CID 7203* (never present in current implementation) | | |
| Acquisition Number | (0020,0012) | IS | (never present in current implementation) | | |
| Instance Number | (0020,0013) | IS | | VNAP | AUTO |
| Patient Orientation | (0020,0020) | CS | | EMPTY | |
| Images in Acquisition | (0020,1002) | IS | (never present in current implementation) | | |
| Image Comments | (0020,4000) | LT | | ANAP | AUTO |
| Quality Control Image | (0028,0300) | CS | (never present in current implementation) | | |
| Burned In Annotation | (0028,0301) | CS | | ALWAYS | CONFIG |

| | | | | | |
|---|---|---|---|---|---|
| Recognizable Visual Features | (0028,0302) | CS | (never present in current implementation) | | |
| Lossy Image Compression | (0028,2110) | CS | "00" | ALWAYS | FIX |
| Lossy Image Compression Ratio | (0028,2112) | DS | (never present in current implementation) | | |
| Lossy Image Compression Method | (0028,2114) | CS | (never present in current implementation) | | |
| Icon Image Sequence | (0088,0200) | SQ | *ImgPxMc* (never present in current implementation) | | |
| Presentation LUT Shape | (2050,0020) | CS | (never present in CR/XA/XRF IODs) | ALWAYS | AUTO |
| *Any other Attribute of this Module* | | | (never present in current implementation) | | |

**Table 8.1-16**
**Image Pixel Module**

| Attribute Name | Tag | VR | Value | Presence of Value | Source |
|---|---|---|---|---|---|
| *Include 'Image Pixel Macro'* | | | See Table 8.1-6 | | |
| Pixel Padding Range Limit | (0028,0121) | US | (never present in current implementation) | | |
| *Any other Attribute of this Module* | | | (never present in current implementation) | | |

**Table 8.1-17**
**CR Image Module**

| Attribute Name | Tag | VR | Value | Presence of Value | Source |
|---|---|---|---|---|---|
| KVP | (0018,0060) | DS | | ANAP | AUTO |
| Plate ID | (0018,1004) | LO | (never present in current implementation) | | |
| Distance Source to Detector | (0018,1110) | DS | | VNAP | AUTO |
| Distance Source to Patient | (0018,1111) | DS | (never present in current implementation) | | |
| Exposure Time | (0018,1150) | IS | | VNAP | AUTO |
| X-Ray Tube Current | (0018,1151) | IS | | VNAP | AUTO |
| Exposure | (0018,1152) | IS | | ANAP | AUTO |
| Exposure in µAs | (0018,1153) | IS | | ANAP | AUTO |
| Imager Pixel Spacing | (0018,1164) | DS | | ALWAYS | AUTO |
| Sensitivity | (0018,6000) | DS | | VNAP | AUTO |
| Photometric Interpretation | (0028,0004) | CS | "MONOCHROME2" | ALWAYS | FIX |
| Pixel Spacing | (0028,0030) | DS | | ANAP | AUTO |
| Pixel Spacing Calibration Type | (0028,0A02) | CS | (never present in current implementation) | | |
| Pixel Spacing Calibration Description | (0028,0A04) | LO | (never present in current implementation) | | |
| Calibration Image | (0050,0004) | CS | (never present in current implementation) | | |
| *Any other Attribute of this Module* | | | (never present in current implementation) | | |

**Table 8.1-18**
**DX Anatomy Imaged Module**

| Attribute Name | Tag | VR | Value | Presence of Value | Source |
|---|---|---|---|---|---|
| Anatomic Region Sequence | (0008,2218) | SQ | *CdMc-DCID 4031* | EMPTY | |
| >Anatomic Region Modifier Sequence | (0008,2220) | SQ | *CdMC-DCID 2* (never present in current implementation) | | |
| Image Laterality | (0020,0062) | CS | | ALWAYS | AUTO |
| *Any other Attribute of this Module* | | | (never present in current implementation) | | |

**Table 8.1-19**
**DX Image Module**

| Attribute Name | Tag | VR | Value | Presence of Value | Source |
|---|---|---|---|---|---|
| Image Type | (0008,0008) | CS | "DERIVED\PRIMARY" | ALWAYS | FIX |
| Derivation Description | (0008,2111) | ST | (never present in current implementation) | | |
| Patient Orientation | (0020,0020) | CS | | EMPTY | |
| Samples per Pixel | (0028,0002) | US | 1 | ALWAYS | FIX |
| Photometric Interpretation | (0028,0004) | CS | | ALWAYS | AUTO |
| Bits Allocated | (0028,0100) | US | | ALWAYS | CONFIG |
| Bits Stored | (0028,0101) | US | | ALWAYS | CONFIG |
| High Bit | (0028,0102) | US | | ALWAYS | CONFIG |
| Pixel Representation | (0028,0103) | US | 0 | ALWAYS | FIX |
| Burned In Annotation | (0028,0301) | CS | | ALWAYS | CONFIG |
| Pixel Intensity Relationship | (0028,1040) | CS | "LIN" | ALWAYS | FIX |
| Pixel Intensity Relationship Sign | (0028,1041) | SS | -1 | ALWAYS | FIX |
| Window Center | (0028,1050) | DS | | ANAP | CONFIG |
| Window Width | (0028,1051) | DS | | ANAP | CONFIG |
| Rescale Intercept | (0028,1052) | DS | "0" | ALWAYS | FIX |
| Rescale Slope | (0028,1053) | DS | "1" | ALWAYS | FIX |
| Rescale Type | (0028,1054) | LO | "US" | ALWAYS | FIX |
| Window Center & Width Explanation | (0028,1055) | LO | (never present in current implementation) | | |
| Lossy Image Compression | (0028,2110) | CS | "00" | ALWAYS | FIX |
| Lossy Image Compression Ratio | (0028,2112) | DS | (never present in current implementation) | | |
| VOI LUT Sequence | (0028,3010) | SQ | | ANAP | AUTO |
| >LUT Descriptor | (0028,3002) | US | | ALWAYS | AUTO |
| >LUT Explanation | (0028,3003) | LO | (never present in current implementation) | | |
| >LUT Data | (0028,3006) | US/ OW | | ALWAYS | AUTO |
| Calibration Image | (0050,0004) | CS | (never present in current implementation) | | |
| Presentation LUT Shape | (2050,0020) | CS | | ALWAYS | AUTO |
| *Any other Attribute of this Module* | | | (never present in current implementation) | | |

**Table 8.1-20**
**X-Ray Image Module**

| Attribute Name | Tag | VR | Value | Presence of Value | Source |
|---|---|---|---|---|---|
| Image Type | (0008,0008) | CS | "DERIVED\PRIMARY" | ALWAYS | FIX |
| Referenced Image Sequence | (0008,1140) | SQ | *ImgSOPMc* (never present in current implementation) | | |
| >Purpose of Reference Code Sequence | (0040,A170) | SQ | *CdMc-CID 7201* (never present in current implementation) | | |
| Derivation Description | (0008,2111) | ST | (never present in current implementation) | | |
| Anatomic Region Sequence | (0008,2218) | SQ | *CdMc-DCID 4031*(never present in current implementation) | | |
| >Anatomic Region Modifier Sequence | (0008,2220) | SQ | *CdMC-DCID 2* (never present in current implementation) | | |
| Scan Options | (0018,0022) | CS | (never present in current implementation) | | |
| Acquisition Device Processing Description | (0018,1400) | LO | (never present in current implementation) | | |

| | | | | | |
|---|---|---|---|---|---|
| Frame Label Vector | (0018,2002) | SH | (never present in current implementation) | | |
| Samples per Pixel | (0028,0002) | US | 1 | ALWAYS | FIX |
| Photometric Interpretation | (0028,0004) | CS | “MONOCHROME2” | ALWAYS | FIX |
| Frame Increment Pointer | (0028,0009) | AT | (0018,1065) | ALWAYS | FIX |
| Frame Dimension Pointer | (0028,000A) | AT | (never present in current implementation) | | |
| Bits Allocated | (0028,0100) | US | | ALWAYS | CONFIG |
| Bits Stored | (0028,0101) | US | | ALWAYS | CONFIG |
| High Bit | (0028,0102) | US | | ALWAYS | CONFIG |
| Pixel Representation | (0028,0103) | US | 0 | ALWAYS | FIX |
| Pixel Intensity Relationship | (0028,1040) | CS | “LIN” | ALWAYS | FIX |
| Lossy Image Compression | (0028,2110) | CS | “00” | ALWAYS | FIX |
| R Wave Pointer | (0028,6040) | US | (never present in current implementation) | | |
| Calibration Image | (0050,0004) | CS | (never present in current implementation) | | |
| *Any other Attribute of this Module* | | | (never present in current implementation) | | |

**Table 8.1-21**
**Cine Module**

| Attribute Name | Tag | VR | Value | Presence of Value | Source |
|---|---|---|---|---|---|
| Start Trim | (0008,2142) | IS | (never present in current implementation) | | |
| Stop Trim | (0008,2143) | IS | (never present in current implementation) | | |
| Recommended Display Frame Rate | (0008,2144) | IS | (never present in current implementation) | | |
| Cine Rate | (0018,0040) | IS | (never present in current implementation) | | |
| Frame Time | (0018,1063) | DS | (never present in current implementation) | | |
| Frame Time Vector | (0018,1065) | DS | | ALWAYS | AUTO |
| Preferred Playback Sequencing | (0018,1244) | US | (never present in current implementation) | | |
| *Any other Attribute of this Module* | | | (never present in current implementation) | | |

**Table 8.1-22**
**Multi-Frame Module**

| Attribute Name | Tag | VR | Value | Presence of Value | Source |
|---|---|---|---|---|---|
| Number of Frames | (0028,0008) | IS | | ALWAYS | AUTO |
| Frame Increment Pointer | (0028,0009) | AT | (0018,1065) | ALWAYS | FIX |
| *Any other Attribute of this Module* | | | (never present in current implementation) | | |

**Table 8.1-23**
**General Equipment Module**

| Attribute Name | Tag | VR | Value | Presence of Value | Source |
|---|---|---|---|---|---|
| Manufacturer | (0008,0070) | LO | Default: “Digitec” | VNAP | CONFIG |
| Institution Name | (0008,0080) | LO | | VNAP | CONFIG |
| Institution Address | (0008,0081) | LO | (never present in current implementation) | | |
| Station Name | (0008,1010) | LO | “INSIDE_SW” | ANAP | FIX |
| Institutional Department Name | (0008,1040) | LO | (never present in current implementation) | | |
| Manufacturer’s Model Name | (0008,1090) | LO | Default: “INSIDE_SW” | VNAP | CONFIG |
| Device Serial Number | (0018,1000) | LO | Default: auto detected | ALWAYS | CONFIG/ AUTO |
| Gantry ID | (0018,1008) | LO | (never present in current implementation) | | |

| | | | | | |
|---|---|---|---|---|---|
| Software Version | (0018,1020) | LO | | ALWAYS | AUTO |
| Spatial Resolution | (0018,1050) | LO | (never present in current implementation) | | |
| Date of Last Calibration | (0018,1200) | LO | (never present in current implementation) | | |
| Time of Last Calibration | (0018,1201) | LO | (never present in current implementation) | | |
| Pixel Padding Value | (0028,0120) | US | (never present in current implementation) | | |
| *Any other Attribute of this Module* | | | (never present in current implementation) | | |

**Table 8.1-24**
**Enhanced General Equipment Module**

| Attribute Name | Tag | VR | Value | Presence of Value | Source |
|---|---|---|---|---|---|
| Manufacturer | (0008,0070) | LO | Default: “Digitec” | ALWAYS | CONFIG |
| Manufacturer’s Model Name | (0008,1090) | LO | Default: “INSIDE_SW” | ALWAYS | CONFIG |
| Device Serial Number | (0018,1000) | LO | Default: auto detected | ALWAYS | CONFIG |
| Software Version | (0018,1020) | LO | | ALWAYS | AUTO |
| *Any other Attribute of this Module* | | | (never present in current implementation) | | |

**Table 8.1-25**
**Contrast/Bolus Module**

| Attribute Name | Tag | VR | Value | Presence of Value | Source |
|---|---|---|---|---|---|
| Contrast/Bolus Agent | (0018,0010) | LO | | EMPTY | |
| Contrast/Bolus Agent Sequence | (0018,0012) | SQ | *CdMc-BCID 12* (never present in current implementation) | | |
| *Any other Attribute of this Module* | | | (never present in current implementation) | | |

**Table 8.1-26**
**DX Detector Module**

| Attribute Name | Tag | VR | Value | Presence of Value | Source |
|---|---|---|---|---|---|
| Field of View Shape | (0018,1147) | CS | “RECTANGLE” | ANAP | FIX |
| Field of View Dimension(s) | (0018,1149) | IS | | ANAP | AUTO |
| Imager Pixel Spacing | (0018,1164) | DS | | ALWAYS | AUTO |
| Exposure Index | (0018,1411) | DS | (never present in XA/XRF IODs) | ANAP | AUTO |
| Target Exposure Index | (0018,1412) | DS | (never present in XA/XRF IODs) | ANAP | AUTO |
| Deviation Index | (0018,1413) | DS | (never present in XA/XRF IODs) | ANAP | AUTO |
| Sensitivity | (0018,6000) | DS | (never present in XA/XRF IODs) | VNAP | AUTO |
| Detector Temperature | (0018,7001) | DS | (never present in current implementation) | | |
| Detector Type | (0018,7004) | CS | “SCINTILLATOR” | ALWAYS | FIX |
| Detector Configuration | (0018,7005) | CS | “AREA” | ALWAYS | FIX |
| Detector Description | (0018,7006) | LT | (never present in current implementation) | | |
| Detector Mode | (0018,7008) | LT | (never present in current implementation) | | |
| Detector ID | (0018,700A) | SH | (never present in current implementation) | | |
| Date of Last Detector Calibration | (0018,700C) | DA | (never present in current implementation) | | |
| Time of Last Detector Calibration | (0018,700E) | TM | (never present in current implementation) | | |
| Exposures on Detector Since Last Calibration | (0018,7010) | IS | (never present in current implementation) | | |
| Exposures on Detector Since Manufactured | (0018,7011) | IS | (never present in current implementation) | | |

| | | | | | |
|---|---|---|---|---|---|
| Detector Time Since Last Exposure | (0018,7012) | DS | (never present in current implementation) | | |
| Detector Binning | (0018,701A) | DS | | ALWAYS | AUTO |
| Detector Element Physical Size | (0018,7020) | DS | (never present in current implementation) | | |
| Detector Element Spacing | (0018,7022) | DS | (never present in current implementation) | | |
| Detector Active Shape | (0018,7024) | CS | (never present in current implementation) | | |
| Detector Active Dimension(s) | (0018,7026) | DS | (never present in current implementation) | | |
| Detector Active Origin | (0018,7028) | DS | (never present in current implementation) | | |
| Detector Manufacturer Name | (0018,702A) | LO | (never present in current implementation) | | |
| Detector Manufacturer's Model Name | (0018,702B) | LO | (never present in current implementation) | | |
| Field of View Origin | (0018,7030) | DS | (never present in current implementation) | | |
| Field of View Rotation | (0018,7032) | DS | (never present in current implementation) | | |
| Field of View Horizontal Flip | (0018,7034) | CS | (never present in current implementation) | | |
| Pixel Spacing | (0028,0030) | DS | | ANAP | AUTO |
| Pixel Spacing Calibration Type | (0028,0A02) | CS | (never present in current implementation) | | |
| Pixel Spacing Calibration Description | (0028,0A04) | LO | (never present in current implementation) | | |
| *Any other Attribute of this Module* | | | (never present in current implementation) | | |

**Table 8.1-27**
**X-Ray Table Module**

| Attribute Name | Tag | VR | Value | Presence of Value | Source |
|---|---|---|---|---|---|
| Table Motion | (0018,1134) | CS | (never present in current implementation) | | |
| Table Vertical Increment | (0018,1135) | DS | (never present in current implementation) | | |
| Table Lateral Increment | (0018,1136) | DS | (never present in current implementation) | | |
| Table Longitudinal Increment | (0018,1137) | DS | (never present in current implementation) | | |
| Table Angle | (0018,1138) | DS | (never present in current implementation) | | |
| *Any other Attribute of this Module* | | | (never present in current implementation) | | |

**Table 8.1-28**
**X-Ray Collimator Module**

| Attribute Name | Tag | VR | Value | Presence of Value | Source |
|---|---|---|---|---|---|
| Collimator Shape | (0018,1700) | CS | "RECTANGULAR" | ANAP | FIX |
| Collimator Left Vertical Edge | (0018,1702) | IS | | ANAP | AUTO |
| Collimator Right Vertical Edge | (0018,1704) | IS | | ANAP | AUTO |
| Collimator Upper Horizontal Edge | (0018,1706) | IS | | ANAP | AUTO |
| Collimator Lower Horizontal Edge | (0018,1708) | IS | | ANAP | AUTO |
| *Any other Attribute of this Module* | | | (never present in current implementation) | | |

**Table 8.1-29**
**DX Positioning Module**

| Attribute Name | Tag | VR | Value | Presence of Value | Source |
|---|---|---|---|---|---|
| Distance Source to Detector | (0018,1110) | DS | | VNAP | AUTO |
| Distance Source to Patient | (0018,1111) | DS | (never present in current implementation) | | |
| Estimated Radiographic Magnification Factor | (0018,1114) | DS | (never present in current implementation) | | |

| | | | | | |
|---|---|---|---|---|---|
| Table Angle | (0018,1138) | DS | (never present in current implementation) | | |
| Table Type | (0018,113A) | CS | (never present in current implementation) | | |
| Body Part Thickness | (0018,11A0) | DS | (never present in current implementation) | | |
| Compression Force | (0018,11A2) | DS | (never present in current implementation) | | |
| Column Angulation | (0018,1450) | DS | (never present in current implementation) | | |
| Positioner Type | (0018,1508) | CS | | EMPTY | |
| Positioner Primary Angle | (0018,1510) | DS | (never present in current implementation) | | |
| Positioner Secondary Angle | (0018,1511) | DS | (never present in current implementation) | | |
| Detector Primary Angle | (0018,1530) | DS | (never present in current implementation) | | |
| Detector Secondary Angle | (0018,1531) | DS | (never present in current implementation) | | |
| Patient Position | (0018,5100) | CS | (never present in current implementation) | | |
| View Position | (0018,5101) | CS | | VNAP | MWL/ USER |
| Projection Eponymous Name Code Sequence | (0018,5104) | SQ | *CdMc-BCID 4012* (never present in current implementation) | | |
| View Code Sequence | (0054,0220) | SQ | *CdMc-BCID 4010* (never present in current implementation) | | |
| >View Modifier Code Sequence | (0054,0222) | SQ | *CdMc-BCID 4011* (never present in current implementation) | | |
| Patient Orientation Code Sequence | (0054,0410) | SQ | *CdMc-BCID 19* (never present in current implementation) | | |
| >Patient Orientation Modifier Code Sequence | (0054,0412) | SQ | *CdMc-BCID 20* (never present in current implementation) | | |
| Patient Gantry Relationship Code Sequence | (0054,0414) | SQ | *CdMc-BCID 21* (never present in current implementation) | | |
| *Any other Attribute of this Module* | | | (never present in current implementation) | | |

**Table 8.1-30**
**XA Positioner Module**

| Attribute Name | Tag | VR | Value | Presence of Value | Source |
|---|---|---|---|---|---|
| Distance Source to Detector | (0018,1110) | DS | | VNAP | AUTO |
| Distance Source to Patient | (0018,1111) | DS | (never present in current implementation) | | |
| Estimated Radiographic Magnification Factor | (0018,1114) | DS | (never present in current implementation) | | |
| Positioner Motion | (0018,1500) | CS | | EMPTY | |
| Positioner Primary Angle | (0018,1510) | DS | | EMPTY | |
| Positioner Secondary Angle | (0018,1511) | DS | | EMPTY | |
| Positioner Primary Angle Increment | (0018,1520) | DS | | EMPTY | |
| Positioner Secondary Angle Increment | (0018,1521) | DS | | EMPTY | |
| Detector Primary Angle | (0018,1530) | DS | (never present in current implementation) | | |
| Detector Secondary Angle | (0018,1531) | DS | (never present in current implementation) | | |
| *Any other Attribute of this Module* | | | (never present in current implementation) | | |

**Table 8.1-31**
**XRF Positioner Module**

| Attribute Name | Tag | VR | Value | Presence of Value | Source |
|---|---|---|---|---|---|
| Distance Source to Detector | (0018,1110) | DS | | VNAP | AUTO |
| Distance Source to Patient | (0018,1111) | DS | (never present in current implementation) | | |

| | | | | | |
|---|---|---|---|---|---|
| Estimated Radiographic Magnification Factor | (0018,1114) | DS | (never present in current implementation) | | |
| Column Angulation | (0018,1450) | DS | (never present in current implementation) | | |
| *Any other Attribute of this Module* | | | (never present in current implementation) | | |

**Table 8.1-32**
**X-Ray Tomography Acquisition Module**

| Attribute Name | Tag | VR | Value | Presence of Value | Source |
|---|---|---|---|---|---|
| Tomo Layer Height | (0018,1460) | DS | | ANAP | AUTO |
| Tomo Angle | (0018,1470) | DS | | ANAP | AUTO |
| Tomo Time | (0018,1480) | DS | | ANAP | AUTO |
| Tomo Type | (0018,1490) | CS | | ANAP | AUTO |
| Tomo Class | (0018,1491) | CS | | ANAP | AUTO |
| Number of Tomosynthesis Source Images | (0018,1495) | IS | | ANAP | AUTO |
| *Any other Attribute of this Module* | | | (never present in current implementation) | | |

**Table 8.1-33**
**X-Ray Acquisition Module**

| Attribute Name | Tag | VR | Value | Presence of Value | Source |
|---|---|---|---|---|---|
| KVP | (0018,0060) | DS | | VNAP | AUTO |
| Field of View Shape | (0018,1147) | CS | “RECTANGLE” | ANAP | FIX |
| Field of View Dimension(s) | (0018,1149) | IS | | ANAP | AUTO |
| Exposure Time | (0018,1150) | IS | | VNAP | AUTO |
| X-Ray Tube Current | (0018,1151) | IS | | VNAP | AUTO |
| Exposure | (0018,1152) | IS | | ANAP | AUTO |
| Exposure in μAs | (0018,1153) | IS | | ANAP | AUTO |
| Average Pulse Width | (0018,1154) | DS | (never present in current implementation) | | |
| Radiation Setting | (0018,1155) | CS | | ALWAYS | AUTO |
| Radiation Mode | (0018,115A) | CS | | ANAP | AUTO |
| Image and Fluoroscopy Area Dose Product | (0018,115E) | DS | | ANAP | AUTO |
| Type of Filters | (0018,1161) | LO | | VNAP | AUTO |
| Intensifier Size | (0018,1162) | DS | (never present in current implementation) | | |
| Imager Pixel Spacing | (0018,1164) | DS | | ALWAYS | AUTO |
| Grid | (0018,1166) | CS | (never present in current implementation) | | |
| Focal Spot | (0018,1190) | DS | (never present in current implementation) | | |
| Exposure Time in μS | (0018,8150) | DS | | ANAP | AUTO |
| X-Ray Tube Current in μA | (0018,8151) | DS | | ANAP | AUTO |
| Pixel Spacing | (0028,0030) | DS | | ANAP | AUTO |
| Pixel Spacing Calibration Type | (0028,0A02) | CS | (never present in current implementation) | | |
| Pixel Spacing Calibration Description | (0028,0A04) | LO | (never present in current implementation) | | |
| *Any other Attribute of this Module* | | | (never present in current implementation) | | |

**Table 8.1-34**
**X-Ray Acquisition Dose Module**

| Attribute Name | Tag | VR | Value | Presence of Value | Source |
|---|---|---|---|---|---|

| | | | | | |
|---|---|---|---|---|---|
| KVP | (0018,0060) | DS | | ANAP | AUTO |
| Distance Source to Detector | (0018,1110) | DS | | VNAP | AUTO |
| Distance Source to Patient | (0018,1111) | DS | (never present in current implementation) | | |
| Exposure Time | (0018,1150) | IS | | VNAP | AUTO |
| X-Ray Tube Current | (0018,1151) | IS | | VNAP | AUTO |
| Exposure | (0018,1152) | IS | | ANAP | AUTO |
| Exposure in µAs | (0018,1153) | IS | | ANAP | AUTO |
| Rectification Type | (0018,1156) | CS | (never present in current implementation) | | |
| Image and Fluoroscopy Area Dose Product | (0018,115E) | DS | | ANAP | AUTO |
| Filter Type | (0018,1160) | SH | | VNAP | AUTO |
| Anode Target Material | (0018,1191) | CS | (never present in current implementation) | | |
| Body Part Thickness | (0018,11A0) | DS | (never present in current implementation) | | |
| Relative X-Ray Exposure | (0018,1405) | IS | | VNAP | AUTO |
| Exposure Index | (0018,1411) | DS | | ANAP | AUTO |
| Target Exposure Index | (0018,1412) | DS | | ANAP | AUTO |
| Deviation Index | (0018,1413) | DS | | ANAP | AUTO |
| Filter Material | (0018,7050) | CS | (never present in current implementation) | | |
| Filter Thickness Minimum | (0018,7052) | DS | (never present in current implementation) | | |
| Filter Thickness Maximum | (0018,7054) | DS | (never present in current implementation) | | |
| Filter Beam Path Length Minimum | (0018,7056) | FL | (never present in current implementation) | | |
| Filter Beam Path Length Maximum | (0018,7058) | FL | (never present in current implementation) | | |
| Exposure Time in µS | (0018,8150) | DS | | ANAP | AUTO |
| X-Ray Tube Current in µA | (0018,8151) | DS | | ANAP | AUTO |
| Entrance Dose | (0040,0302) | US | | ANAP | AUTO |
| Exposed Area | (0040,0303) | US | (never present in current implementation) | | |
| Distance Source to Entrance | (0040,0306) | DS | (never present in current implementation) | | |
| Comments on Radiation Dose | (0040,0310) | ST | (never present in current implementation) | | |
| X-Ray Output | (0040,0312) | DS | (never present in current implementation) | | |
| Half Value Layer | (0040,0314) | DS | (never present in current implementation) | | |
| Organ Dose | (0040,0316) | DS | (never present in current implementation) | | |
| Organ Exposed | (0040,0318) | CS | (never present in current implementation) | | |
| Entrance Dose in mGy | (0040,8302) | DS | | ANAP | AUTO |
| *Any other Attribute of this Module* | | | (never present in current implementation) | | |

**Table 8.1-35**
**X-Ray Generation Module**

| Attribute Name | Tag | VR | Value | Presence of Value | Source |
|---|---|---|---|---|---|
| KVP | (0018,0060) | DS | | ANAP | AUTO |
| Generator ID | (0018,1005) | LO | (never present in current implementation) | | |
| Exposure Time | (0018,1150) | IS | | VNAP | AUTO |
| X-Ray Tube Current | (0018,1151) | IS | | VNAP | AUTO |
| Exposure | (0018,1152) | IS | | ANAP | AUTO |
| Exposure in µAs | (0018,1153) | IS | | ANAP | AUTO |
| Rectification Type | (0018,1156) | CS | (never present in current implementation) | | |
| Focal Spot | (0018,1190) | DS | (never present in current implementation) | | |
| Anode Target Material | (0018,1191) | CS | (never present in current implementation) | | |
| Exposure Control Mode | (0018,7060) | CS | (never present in current implementation) | | |

| | | | | | |
|---|---|---|---|---|---|
| Exposure Control Mode Description | (0018,7062) | LT | (never present in current implementation) | | |
| Exposure Status | (0018,7064) | CS | (never present in current implementation) | | |
| Phototimer Setting | (0018,7065) | DS | (never present in current implementation) | | |
| Exposure Time in µS | (0018,8150) | DS | | ANAP | AUTO |
| X-Ray Tube Current in µA | (0018,8151) | DS | | ANAP | AUTO |
| *Any other Attribute of this Module* | | | (never present in current implementation) | | |

**Table 8.1-36**
**X-Ray Filtration Module**

| Attribute Name | Tag | VR | Value | Presence of Value | Source |
|---|---|---|---|---|---|
| Filter Type | (0018,1160) | SH | | VNAP | AUTO |
| Filter Material | (0018,7050) | CS | | ANAP | AUTO |
| Filter Thickness Minimum | (0018,7052) | DS | | ANAP | AUTO |
| Filter Thickness Maximum | (0018,7054) | DS | | ANAP | AUTO |
| Filter Beam Path Length Minimum | (0018,7056) | FL | (never present in current implementation) | | |
| Filter Beam Path Length Maximum | (0018,7058) | FL | (never present in current implementation) | | |
| *Any other Attribute of this Module* | | | (never present in current implementation) | | |

**Table 8.1-37**
**X-Ray Grid Module**

| Attribute Name | Tag | VR | Value | Presence of Value | Source |
|---|---|---|---|---|---|
| Grid ID | (0018,1006) | LO | (never present in current implementation) | | |
| Grid | (0018,1166) | CS | | ANAP | AUTO |
| Grid Absorbing Material | (0018,7040) | LT | (never present in current implementation) | | |
| Grid Spacing Material | (0018,7041) | LT | (never present in current implementation) | | |
| Grid Thickness | (0018,7042) | DS | (never present in current implementation) | | |
| Grid Pitch | (0018,7044) | DS | (never present in current implementation) | | |
| Grid Aspect Ratio | (0018,7046) | IS | (never present in current implementation) | | |
| Grid Period | (0018,7048) | DS | (never present in current implementation) | | |
| Grid Focal Distance | (0018,704C) | DS | (never present in current implementation) | | |
| *Any other Attribute of this Module* | | | (never present in current implementation) | | |

**Table 8.1-38**
**VOI Lut Module**

| Attribute Name | Tag | VR | Value | Presence of Value | Source |
|---|---|---|---|---|---|
| Window Center | (0028,1050) | DS | | ANAP | CONFIG |
| Window Width | (0028,1051) | DS | | ANAP | CONFIG |
| Window Center & Width Explanation | (0028,1055) | LO | (never present in current implementation) | | |
| VOI LUT Function | (0028,1056) | CS | (never present in current implementation) | | |
| VOI LUT Sequence | (0028,3010) | SQ | (never present in CR/XA/XRF IODs) | ANAP | AUTO |
| >LUT Descriptor | (0028,3002) | US | (never present in CR/XA/XRF IODs) | ALWAYS | AUTO |
| >LUT Explanation | (0028,3003) | LO | (never present in current implementation) | | |
| >LUT Data | (0028,3006) | US/ OW | (never present in CR/XA/XRF IODs) | ALWAYS | AUTO |

| | | | |
|---|---|---|---|
| *Any other Attribute of this Module* | (never present in current implementation) | | |

**Table 8.1-39**
**Acquisition Context Module**

| Attribute Name | Tag | VR | Value | Presence of Value | Source |
|---|---|---|---|---|---|
| Acquisition Context Sequence | (0040,0555) | SQ | | EMPTY | |
| >Measurement Units Code Sequence | (0040,08EA) | SQ | *CdMc-BCID 82* | | |
| >Value Type | (0040,A040) | CS | | | |
| >Concept Name Code Sequence | (0040,A043) | SQ | *CdMc* | | |
| >Date | (0040,A121) | DA | | | |
| >Time | (0040,A122) | TM | | | |
| >Person Name | (0040,A123) | PN | | | |
| >Referenced Frame Numbers | (0040,A136) | US | | | |
| >Text Value | (0040,A160) | UT | | | |
| >Concept Code Sequence | (0040,A168) | SQ | *CdMc* | | |
| >Numeric Value | (0040,A30A) | DS | | | |
| Acquisition Context Description | (0040,0556) | ST | (never present in current implementation) | | |
| *Any other Attribute of this Module* | | | (never present in current implementation) | | |

**Table 8.1-40**
**Imaging Service Request Module**

| Attribute Name | Tag | VR | Value | Presence of Value | Source |
|---|---|---|---|---|---|
| Requesting Physician | (0032,1032) | PN | | VNAP | MWL |
| Requesting Service | (0032,1033) | LO | | VNAP | MWL |
| *Any other Attribute of this Module* | | | (never present in current implementation) | | |

**Table 8.1-41**
**SR Document General Module**

| Attribute Name | Tag | VR | Value | Presence of Value | Source |
|---|---|---|---|---|---|
| Content Date | (0008,0023) | DA | | ALWAYS | AUTO |
| Content Time | (0008,0033) | TM | | ALWAYS | AUTO |
| Referenced Instance Sequence | (0008,114A) | SQ | | EMPTY | |
| Instance Number | (0020,0013) | IS | | ALWAYS | AUTO |
| Verifying Observer Sequence | (0040,A073) | SQ | | EMPTY | |
| Author Observer Sequence | (0040,A078) | SQ | | EMPTY | |
| Participant Sequence | (0040,A07A) | SQ | | EMPTY | |
| Custodial Organization Sequence | (0040,A07C) | SQ | | EMPTY | |
| Predecessor Documents Sequence | (0040,A360) | SQ | | EMPTY | |
| Referenced Request Sequence | (0040,A370) | SQ | | EMPTY | |
| Performed Procedure Code Sequence | (0040,A372) | SQ | *CdMc* | VNAP | MWL/ USER |
| Current Requested Procedure Evidence Sequence | (0040,A375) | SQ | *HrcSOPMc* | VNAP | AUTO |

| | | | | | |
|---|---|---|---|---|---|
| Pertinent Other Evidence Sequence | (0040,A385) | SQ | *HrcSOPMc* | EMPTY | |
| Completion Flag | (0040,A491) | CS | "COMPLETE" | ALWAYS | FIX |
| Completion Flag Description | (0040,A492) | LO | | EMPTY | |
| Verification Flag | (0040,A493) | CS | "UNVERIFIED" | ALWAYS | FIX |
| Preliminary Flag | (0040,A496) | CS | "FINAL" | ALWAYS | FIX |
| Identical Documents Sequence | (0040,A525) | SQ | *HrcSOPMc* | EMPTY | |
| *Any other Attribute of this Module* | | | (never present in current implementation) | | |

**Table 8.1-42**
**SR Document Content Module**

| Attribute Name | Tag | VR | Value | Presence of Value | Source |
|---|---|---|---|---|---|
| Observation Date Time | (0040,A032) | DT | | ANAP | AUTO |
| *Include Document Content Item Tree – Ref. Table 8.1-43* | | | | ALWAYS | |
| *Any other Attribute of this Module* | | | (never present in current implementation) | | |

The following table is formatted according to template specification tables reported in PS3.16-2011.

**Table 8.1-43**
**X-Ray Radiation Dose SR Document Content Item Tree**

| NL | Rel. with Parent | VT | Concept Name | VM | Value | Presence of Value | Source |
|---|---|---|---|---|---|---|---|
| | | CONTAINER | EV (113701,DCM,01,"X-Ray Radiation Dose") | 1 | "DCMR","10001","SEPARATE" | ALWAYS | FIX |
| > | HAS CONCEPT MOD | CODE | EV (121058,DCM,01, "Procedure Reported") | 1 | EV (113704,DCM,01,"Projection X-Ray") | ALWAYS | FIX |
| >> | HAS CONCEPT MOD | CODE | EV (G-C0E8,SRT,"Has Intent") | 1 | EV (R-408C3,SRT,"Diagnostic Intent") | ALWAYS | FIX |
| > | HAS OBS CONTEXT | CODE | EV (121005,DCM,01, "Observer Type") | 1-n | EV (121007,DCM,01,"Device") | ALWAYS | FIX |
| > | HAS OBS CONTEXT | UIDREF | EV (121012,DCM,01,"Device Observer UID") | | | ALWAYS | AUTO/ CONFIG |
| > | HAS OBS CONTEXT | TEXT | EV (121013,DCM,01,"Device Observer Name ") | | | ANAP | CONFIG |
| > | HAS OBS CONTEXT | TEXT | EV (121014,DCM,01,"Device Observer Manufacturer") | | | ANAP | AUTO/ CONFIG |
| > | HAS OBS CONTEXT | TEXT | EV (121015,DCM,01,"Device Observer Model Name ") | | | ANAP | AUTO/ CONFIG |
| > | HAS OBS CONTEXT | TEXT | EV (121016,DCM,01,"Device Observer Serial Number ") | | | ANAP | AUTO/ CONFIG |
| > | HAS OBS CONTEXT | TEXT | EV (121017,DCM,01,"Device Observer Physical Location During Observation ") | | | ANAP | CONFIG |
| > | HAS OBS CONTEXT | CODE | EV (113876,DCM,01,"Device Role in Procedure ") | | Sel. from BCID(7445) Device Participating Roles | ALWAYS | AUTO/ CONFIG |
| > | HAS OBS CONTEXT | CODE | EV (113705,dcm,01,"Scope of Accumulation") | 1 | EV (113014,DCM,01,"Study") | ALWAYS | FIX |
| >> | HAS PROPERTIES | UIDREF | EV (110180,DCM,01,"Study Instance UID") | 1 | | ALWAYS | MWL/ AUTO |
| > | CONTAINS | CODE | EV (113945,DCM,01,"X-Ray Detector Data Available") | 0-1 | EV (R-00339,SRT,"No") | ANAP | FIX |
| > | CONTAINS | CODE | EV (113943,DCM,01,"X-Ray Source Data Available") | 0-1 | EV (R-00339,SRT,"No") | ANAP | FIX |
| > | CONTAINS | CODE | EV (113944,DCM,01,"X-Ray Mechanical Data Available") | 1 | EV (R-00339,SRT,"No") | ALWAYS | FIX |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| > | CONTAINS | CONTAINER | EV (113702,DCM,01, ”Accumulated X-Ray Dose Data”) | 1 | “DCMR”,”10002”,”SEPARATE” | ALWAYS | FIX |
| >> | HAS CONCEPT MOD | CODE | EV (113764,DCM,01, "Acquisition Plane”) | 1 | EV (113622,DCM,01,”Single Plane”) | ALWAYS | FIX |
| >> | CONTAINS | CONTAINER | EV (122505,DCM,01, ”Calibration”) | 0-n | | ANAP | AUTO |
| >>> | HAS CONCEPT MOD | CODE | EV (113794,DCM,01,”Dose Measurement Device”) | 1 | EV (A-2C090,SRT,”Dosimeter”) | ALWAYS | FIX |
| >>> | CONTAINS | DATETIME | EV (113723,DCM,01, ”Calibration Date”) | 1 | | ALWAYS | CONFIG |
| >>> | CONTAINS | NUM | EV (122322,DCM,01, ”Calibration Factor”) | 1 | Units = EV (1,UCUM,”no units”) | ALWAYS | CONFIG |
| >>> | CONTAINS | NUM | EV (113763,DCM,01, ”Calibration Uncertainty”) | 1 | Units= EV (%,UCUM,”Percent”) | ALWAYS | CONFIG |
| >>> | CONTAINS | TEXT | EV (113724,DCM,01, ”Calibration Responsible Party”) | 1 | | ALWAYS | CONFIG |
| >> | CONTAINS | NUM | EV (113722,DCM,01, ”Dose Area Product Total”) | 1 | Units = EV (Gy.m2,UCUM,”Gy.m2”) | ALWAYS | AUTO |
| >> | CONTAINS | NUM | EV (113725, DCM, “Dose (RP) Total”) | 1 | Units = EV (Gy,UCUM,”Gy”) | ALWAYS | AUTO |
| >> | CONTAINS | NUM | EV (113726,DCM,01,”Fluoro Dose Area Product Total”) | 1 | Units = EV (Gy.m2,UCUM,”Gy.m2”) | ALWAYS | AUTO |
| >> | CONTAINS | NUM | EV (113728, DCM, “Fluoro Dose (RP) Total”) | 1 | Units = EV (Gy,UCUM,”Gy”) | ALWAYS | AUTO |
| >> | CONTAINS | NUM | EV (113730,DCM,01,”Total Fluoro Time”) | 1 | Units = EV (s,UCUM,”s”) | ALWAYS | AUTO |
| >> | CONTAINS | NUM | EV (113727,DCM,01, ”Acquisition Dose Area Product Total”) | 1 | Units = EV (Gy.m2,UCUM,”Gy.m2”) | ALWAYS | AUTO |
| >> | CONTAINS | NUM | EV (113729, DCM,01, “Acquisition Dose (RP) Total”) | 1 | Units = EV (Gy,UCUM,”Gy”) | ALWAYS | AUTO |
| >> | CONTAINS | NUM | EV (113855,DCM,01,”Total Acquisition Time”) | 1 | Units = EV (s,UCUM,”s”) | ALWAYS | AUTO |
| >> | CONTAINS | CODE | EV (113780, DCM, “Reference Point Definition”) | 1 | Sel. from DCID (10025) Radiation Dose Reference Points | ANAP | CONFIG |
| >> | CONTAINS | TEXT | EV (113780, DCM, “Reference Point Definition”) | 1 | | ANAP | CONFIG |
| >> | CONTAINS | CODE | EV (113876,DCM,01,”Device Role In Procedure”) | 0-1 | EV (113859,DCM,01,”Irradiating Device”) | ANAP | FIX |
| >>> | HAS PROPERTIES | TEXT | EV (113877,DCM,01,”Device Name”) | 1 | | ANAP | CONFIG |
| >>> | HAS PROPERTIES | TEXT | EV (113878,DCM,01,”Device Manufacturer”) | 1 | | ALWAYS | CONFIG |
| >>> | HAS PROPERTIES | TEXT | EV (113879,DCM,01,”Device Model Name”) | 1 | | ALWAYS | CONFIG |
| >>> | HAS PROPERTIES | TEXT | EV (113880,DCM,01,”Device Serial Number”) | 1 | | ALWAYS | CONFIG |
| >>> | HAS PROPERTIES | UIDREF | EV (121012,DCM,01,”Device Observer UID”) | 1 | | ALWAYS | CONFIG |
| > | CONTAINS | CONTAINER | EV (113706,DCM,01, ”Irradiation Event X-Ray Data”) | 1-n | “DCMR”,”10003”,”SEPARATE” | ALWAYS | FIX |
| >> | HAS CONCEPT MOD | CODE | EV (113764,DCM,01, "Acquisition Plane”) | 1 | EV (113622,DCM,01,”Single Plane”) | ALWAYS | FIX |
| >> | CONTAINS | UIDREF | EV (113769,DCM,01, ”Irradiation Event UID”) | 1 | | ALWAYS | AUTO |
| >> | CONTAINS | DATETIME | EV (111526,DCM,01, "Date Time Started”) | 1 | | ALWAYS | AUTO |
| >> | CONTAINS | CODE | EV (113721,DCM,01, ”Irradiation Event Type”) | 1 | Sel. from DCID (10002) Irradiation Event Types | ALWAYS | AUTO |
| >> | CONTAINS | CODE | EV (123014,DCM,01,”Target Region”) | 1 | Sel. from DCID (4031) Common Anatomic Regions | ALWAYS | AUTO |
| >> | CONTAINS | NUM | EV (122130,DCM,01, ”Dose Area Product”) | 1 | Units = EV (Gy.m1,UCUM,”Gy.m2”) | ALWAYS | AUTO |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| >> | CONTAINS | NUM | EV (113845,DCM,01, ”Exposure Index”) | 0-1 | Units = EV (1,UCUM,”no units”) | ANAP | AUTO |
| >> | CONTAINS | NUM | EV (113846,DCM,01, ”Target Exposure Index”) | 0-1 | Units = EV (1,UCUM,”no units”) | ANAP | CONFIG |
| >> | CONTAINS | NUM | EV (113847,DCM,01, ”Deviation Index”) | 0-1 | Units = EV (1,UCUM,”no units”) | ANAP | AUTO |
| >> | CONTAINS | IMAGE | EV (113795,DCM,01, ”Acquired Image”) | 0-n | | ANAP | AUTO |
| >> | CONTAINS | NUM | EV (113738, DCM, 01 “Dose (RP)”) | 1 | Units = EV (Gy, UCUM, “Gy”) | ALWAYS | AUTO |
| >> | CONTAINS | TEXT | EV (113780, DCM, 01 “Reference Point Definition”) | 1 | | ANAP | CONFIG |
| >> | CONTAINS | CODE | EV (113780, DCM, 01, “Reference Point Definition”) | 1 | Sel. from DCID (10025) Radiation Dose Reference Points | ANAP | CONFIG |
| >> | CONTAINS | CODE | EV (113732,DCM,01, ”Fluoro Mode”) | 0-1 | Sel. from DCID(10004) Fluoro Modes | ANAP | AUTO |
| >> | CONTAINS | NUM | EV (113791,DCM,01, ”Pulse Rate”) | 0-1 | Units = EV ({pulse}/s,UCUM,”pulse/s”) | ANAP | AUTO |
| >> | CONTAINS | NUM | EV (113768,DCM,01, ”Number of Pulses”) | 0-1 | Units = EV (1,UCUM,”no units”) | ANAP | AUTO |
| >> | CONTAINS | NUM | EV (113742,DCM,01, "Irradiation Duration") | 0-1 | Units = EV (s,UCUM,”s”) | ANAP | AUTO |
| >> | CONTAINS | NUM | EV (113733,DCM,01,”KVP”) | 0-1 | Units = EV (kV,UCUM,”kV”) | ANAP | AUTO |
| >> | CONTAINS | NUM | EV (113734,DCM,01,”X-Ray Tube Current””) | 0-1 | Units = EV (mA,UCUM,”mA”) | ANAP | AUTO |
| >> | CONTAINS | NUM | EV (113767,DCM,01,” Average X-Ray Tube Current””) | 0-1 | Units = EV (mA,UCUM,”mA”) | ANAP | AUTO |
| >> | CONTAINS | NUM | EV (113824,DCM,01, ”Exposure Time”) | 0-1 | Units = EV (ms,UCUM,”ms”) | ANAP | AUTO |
| >> | CONTAINS | NUM | EV (113736,DCM,01, ”Exposure”) | 0-1 | Units = EV (uAs,UCUM,”uAs”) | ANAP | AUTO |
| >> | CONTAINS | CONTAINER | EV (113771, DCM, “X-Ray Filters”) | 1-n | | ANAP | AUTO |
| >>> | CONTAINS | CODE | EV (113772, DCM, “X-Ray Filter Type”) | 1 | Sel. from DCID (10007) X-Ray Filter Types | ANAP | AUTO |
| >>> | CONTAINS | CODE | EV (113757, DCM, “X-Ray Filter Material”) | 1 | Sel. from DCID (10006) X-Ray Filter Materials | ANAP | AUTO |
| >>> | CONTAINS | NUM | EV (113758, DCM, “X-Ray Filter Thickness Minimum”) | 1 | Units = EV (mm, UCUM, “mm”) | ANAP | AUTO |
| >>> | CONTAINS | NUM | EV (113773, DCM, “X-Ray Filter Thickness Maximum”) | 1 | Units = EV (mm, UCUM, “mm”) | ANAP | AUTO |
| >> | CONTAINS | NUM | EV (113790, DCM, 01, ”Collimated Field Area”) | 1 | Units = EV (m2,UCUM,”m2”) | ANAP | AUTO |
| >> | CONTAINS | NUM | EV (113788, DCM, 01, ”Collimated Field Height”) | 1 | Units = EV (mm,UCUM,”mm”) | ANAP | AUTO |
| >> | CONTAINS | NUM | EV (113789, DCM, 01, ”Collimated Field Width”) | 1 | Units = EV (mm,UCUM,”mm”) | ANAP | AUTO |
| >> | CONTAINS | CODE | EV (111635,DCM,01, ”X-Ray Grid”) | 1-n | Sel. from DCID (10017) X-Ray Grid | ANAP | AUTO |
| >> | CONTAINS | CODE | EV (113876,DCM,01,”Device Role In Procedure”) | 0-1 | EV (113859,DCM,01,”Irradiating Device”) | ANAP | FIX |
| >>> | HAS PROPERTIES | TEXT | EV (113877,DCM,01,”Device Name”) | 1 | | ANAP | CONFIG |
| >>> | HAS PROPERTIES | TEXT | EV (113878,DCM,01,”Device Manufacturer”) | 1 | | ALWAYS | CONFIG |
| >>> | HAS PROPERTIES | TEXT | EV (113879,DCM,01,“Device Model Name”) | 1 | | ALWAYS | CONFIG |
| >>> | HAS PROPERTIES | TEXT | EV (113880,DCM,01,”Device Serial Number”) | 1 | | ALWAYS | CONFIG |
| >>> | HAS PROPERTIES | UIDREF | EV (121012,DCM,01,”Device Observer UID”) | 1 | | ALWAYS | CONFIG |
| > | CONTAINS | CODE | EV (113854,DCM,01,”Source of Dose Information”) | 1-n | Sel. from DCID(10020) Source of Projection X-Ray Dose Information | ANAP | CONFIG |

### 8.1.2 Usage of Attributes from Received IOD's

Not applicable.

### 8.1.3 Attribute Mapping

Not applicable.

### 8.1.4 Coerced/Modified Fields

None.

## 8.2 Data Dictionary of Private Attributes

None.

## 8.3 Coded Terminology and Templates

### 8.3.1 Context Groups

No Context Group modification or extension are used.

### 8.3.2 Template Specifications

No extensions to standard templates and/or private templates are used.

### 8.3.3 Private Code Definitions

None

## 8.4 Grayscale Image Consistency

Not applicable.

## 8.5 Standard Extended/Specialized/Private SOP Classes

None.

## 8.6 Private Transfer Syntaxes

None.